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Meeting New Conditions

THE doctrine of the survival of the fittest in relation to environment needs to be qualified nowadays by reference to the accelerating rate at which the environment itself is changing.

How electricity supply undertakings are adapting themselves to varying circumstances was effectively illustrated by Mr. Frank Forrest in his presidential address to the I.M.E.A. on Tuesday morning. The Birmingham undertaking, for which he is responsible, furnishes many good instances for quotation, not only because it has the largest output of any municipal concern in Great Britain, but also because its progress has taken place in the presence of great difficulties.

One of its handicaps has been the lack of a plentiful supply of river water for condensing. As Mr. Forrest said, low production costs are more important than striking technical performance, but this is surely an unnecessarily modest claim. Hams Hall compares well with stations having similar steam conditions that are on good river sites, and has shown that reliance upon concrete cooling towers need not be a bar to the attainment of high thermal efficiency—a consideration that is likely to become more prominent as time goes on.

Electrostatic precipitation of flue dust, which has produced such excellent results at this "station in a garden" will, no doubt, give a new lease of life to the use of pulverised fuel and materially increase the proportion of the total coal fired on this system, which now stands at about 16 per cent. for authorised undertakings.

Another difficulty that has been overcome in Birmingham was due to the non-conformity of its system of supply with the recognised standards of to-day, so that d.c. has had to be changed to a.c., and the frequency from 25 to 50 cycles, while the voltages of the transmission and distribution networks have been altered.

The way in which this work has gone through without serious inconvenience to consumers (whose position, indeed, has often been improved as a consequence) probably influenced Mr. Forrest's view that similar standardisation schemes could be put in hand everywhere and completed within a reasonable period by the undertakings concerned.

Strongly entrenched gas interests are generally regarded as an obstacle to electrical progress, yet even they have to yield to the logic of events. The spectacular change-over from gas to electric discharge lamps for 127 miles of street lighting in Birmingham is certainly a sign of the times. As the route includes a large proportion of side streets, the much improved standard of illumination in these should tend to divert traffic from the more congested thoroughfares.

In one way, and it is a very important one, the Midland capital is especially favoured. It is the home of a large number of diversified industries the electrification of which enabled the undertaking to meet so well the depression of a few years back. That adds to its representative character electrically.

Doubtless this was in Mr. Forrest's mind when, in his references to the McGowan Report, he emphasised the advantages of larger supply areas in securing the diversity of demand that comes from a mixed load comprising as many types of application as possible. He might have added that the ability of larger undertakings to retain engineers with special experience in securing various classes of consumer was also a point in favour of the principle.

It is natural that Mr. Forrest should favour public ownership. Whether or no the control of supply undertakings by the people will, as he holds, ultimately prove to be the best method in all cases, there will, we imagine, be none to dispute his opinion that control should be exercised for the people.

Refrigeration

THE paper read by Messrs. W. F. T. Pinkney and A. J. Ryan at the I.M.E.A. Convention yesterday was a good send-off for E.D.A.'s "Refrigeration Fortnight," which commences on Monday. The authors showed how easily the electrical refrigerator scored over the gas-operated type—particularly in size and running cost. They also demonstrated the benefits to be derived by electricity supply authorities from the refrigerator, although on the face of things it would not appear to be a great current consumer. While the annual consumption is below that of a water heater or cooker, the kWh used per kW of demand is well ahead of both. The facts contained in the paper should be used to full advantage during the next two weeks at the special luncheons and demonstrations which are being arranged all over the country. Above all, the considerations of health involved in this matter should be stressed. This is an aspect which will be given prominence by the presence of well-known medical and health authorities at the before-mentioned luncheons.

Contractors and the I.M.E.A.

"LOAD Development" is the arresting title of a handsome brochure which the Electrical Contractors' Association is distributing to the delegates to the Brighton Convention. It is stated to be "A Word to Supply Engineers and Committeemen," and is prefaced by a quotation of the McGowan Committee's commendation of the part played by contractors in the development of electricity supply. This theme is developed in the brochure and instances are cited of close collaboration between contractors and supply authorities of widely differing characters. A lighter touch is provided in the two centre pages, containing some notes on "Royalty at Brighton." The booklet serves as a reminder to electricity supply authorities that another important section of the industry is likely to be considerably affected by the Government's proposals for the reorganisation of distribution, and that there is still enormous scope for the joint efforts of both parties in the work of spreading the use of electricity.

Vehicle Batteries

THIS week's display of electric vehicles at Brighton and the general desire that more rapid headway should be made in this department of the industry may well give rise to curiosity regarding the experience gained with the new types of batteries that are introduced from time to time. It is seldom that information is vouchsafed regarding the Drumm battery. True, it is reported to be doing the piece of work allotted to it, but so many years have elapsed since it made its debut that if it had been proved in practice to possess all the merits with which, once upon a time, one was asked to credit it, not even an Irish Government would have had the heart to deprive humanity of so long awaited a boon.

Colour Correction

SEVERAL 400-W mercury-vapour discharge lamps fixed to the building of the Windmill Theatre at the instance of E.D.A. make the small street in which it is situated one of the most brightly illuminated in the West End. At the same time the complexions of passers-by appear normal. The reason is that the deficiency in red rays is automatically compensated for by the neighbouring neon signs. As the latter are plentiful in urban centres, where approach to daylight may be desirable, an objection to the use of the newer methods of illumination in such places may be overcome by arranging for one type of discharge lighting to help the other.

Supply in Quebec

WHILE in this country the integration of the electricity supply business is envisaged, in Quebec a move has been made in what appears to be the opposite direction. A Bill introduced recently provides for the acquisition of the local supply systems by the municipalities. It is true that special powers are also given to county councils which may lead to larger units, but there seems to be nothing in the Bill designed to bring about any other form of co-ordination. In Ontario, of course, distribution is in the hands of a large number of separate local authorities, but these all derive their power from, and are under the supervision of, the Hydro-Electric Power Commission. Quebec has the greater consumption of electricity and considerably more water power—potential and developed—than Ontario. Whether municipal control (if exercised) will maintain the rate of progress is questionable, unless some form of co-ordination is introduced. Another Bill provides for the setting up of a Provincial Electricity Commission to control *company* undertakings, but municipalities are specifically exempted.

Flueless Rooms

WRITING to *The Times*, Mr. W. Sampson Handley calls for a revision of building by-laws to make compulsory the provision in every living or sleeping room of a ventilating duct of adequate cross-section. As a medical man he regards the abolition of the old-fashioned chimney as likely to impair vigour, at least unless a proper substitute is found, and strongly deprecates the use of gas heating appliances under such conditions. Even if there be no leakage of gas, he points out, the oxygen is exhausted and the products of combustion are discharged into the room. Although the electric fire introduces no dangers of the kind which require the continued use of so clumsy and expensive a construction as the chimney breast, some ventilation is necessary for other reasons, and the recommendation of a recent committee appointed by the Royal College of Physicians that more extended tests should be carried out should be acted upon. Such investigations might take full account of the possible composition (under both normal and abnormal conditions) of the atmosphere requiring periodical change.

Road Safety

IT is encouraging to hear from Mr. W. J. Jones, manager of the E.L.M.A. Lighting Service Bureau, that his recent visit to the United States has shown him that England is well ahead in street lighting at the moment. We say "at the moment" because thorough investigations are being made on the other side into the relation between street accidents and poor lighting, and doubtless a rapid "drive" will shortly be put in hand with great energy. Ours is a poor best, however, compared with what ought to be, and at the recent E.L.M.A. Conference Sir Charles Bressey showed that the Ministry of Transport is fully impressed with the need for better and more uniform illumination in order to promote road safety. He promised that the final report of the Departmental Committee would be a real guide to all interested in public lighting. In any case, we have plenty of examples of what can be done, as there are more discharge lamps in use for lighting main thoroughfares in this country than in the rest of the world put together. What is required is that our secondary and other smaller streets shall be proportionately well lighted. This matter is dealt with by Mr. H. Lingard on another page.

Further Conferences

WITH the I.M.E.A. Convention out of the way, attention must be directed to the further electrical gatherings which have been arranged. Next week (June 9th-12th) the Tramways, Light Railways and Transport Association meets at Edinburgh for its annual congress. After a week's lull there is another burst of activity. On June 22nd and subsequent days the Association of Mining Electrical Engineers gathers at Southport, and on the following day two other conferences commence—that of the Electrical Contractors' Association at Llandudno (changed from Blackpool) and the annual congress of the Municipal Tramways and Transport Association, at which many of the I.M.E.A. delegates will be seen. The Illuminating Engineering Society visits Paris on June 24th to take part in the International Lighting Congress.

The I.M.E.A. at BRIGHTON

42ND ANNUAL CONVENTION

[From our Staff Representatives]

SUNDAY, MAY 30TH.

TO come to the scene set for an I.M.E.A. Convention before the delegates have settled down to the prearranged programme provides each year a most stimulating experience. Discussions about an enormous range of matters of both direct and indirect moment remind one of how much there is always going on in the electrical world for the exercise of the imagination.

In the Convention atmosphere all those present, released for the time being from the more narrowly practical considerations that dominate their normal daily lives, find themselves free to take a wider view of the ultimate objects of their labours and to realise that, despite differences of opinion as to how those objects may best be attained, they have, after all, a common end in view.

This is just as true of supply engineers on whose efforts to increase output progress in design depends as it is of manufacturers in whose laboratories and factories are being prepared the means to meet the ever more exacting conditions that progress imposes. As the I.M.E.A. represents 88 per cent. of the municipal undertakings of Great Britain and Northern Ireland, and as supply companies and manufacturers are represented in considerable numbers, this annual conference has come to be the chief point of contact of the various sections of our great industry.

Whether it is because Brighton as a meeting place is regarded as especially attractive, or whether additional interest is taken in the proceedings this year in view of the McGowan Report, the number of official delegates over whom Mr. F. Forrest will preside easily exceeds previous figures. Mr. J. W. Simpson, the secretary, tells us that it is no less than 1,600, and the proportion of actual I.M.E.A. members is greater than ever. He has to arrange for over 500 at the dinner on Thursday (at which Mr. H. T. Young, the I.E.E. president, will be the principal speaker), and owing to rearrangements necessary at the Dome to accommodate this number the paper on "Domestic Electrical Refrigeration" on the morning of that day will be given at the Grand Hotel.

Brighton's deserved popularity as a conference town has its minor drawbacks. Presumably because such gatherings are so frequent, we missed, on arrival, the usual visual indications that an I.M.E.A. Convention was to be held there and the directions as to how to get to the places mentioned in the programme—that is, apart from the prominently displayed poster of the ELECTRICAL REVIEW near the arrival platforms at the railway station. Another was the inability to secure entry for the Exhibition people to the Corn Exchange until the small hours of Saturday morning. At noon the place had the appearance of the after-effects of an air raid. Mr. V. W. Dale, of E.D.A., seemed quite happy about it, however, and to-day's indications are that there will be no odds and ends left about by opening time.

Every effort is being made to secure the full support of the delegates during the week and the public is invited to come in numbers, but some manufacturers hold that the I.M.E.A. Exhibition will not fully serve its purpose unless visits are organised for those on the staffs of undertakings to whom a chief may delegate the selection of domestic apparatus. It would appear to be highly desirable that deputy managers and consumers' engineers, at least, should be permitted to take advantage of this annual opportunity to compare the latest developments of many manufacturers.

The Mayor of Brighton, indisposed, talks to Convention delegates from his room

Naturally, matters arising out of the McGowan Report and the so-called "White Paper" are being debated with healthy vigour. The subject is to be officially discussed by the

Left: The President with Mrs. R. E. G. Ferguson. Right: Delegates registering at the Dome

Left: Mr. Allen West, who organised the E.I.B.A. flag day with some friends. Right: Mr. F. W. Purse being "flagged"

I.M.E.A. Council on Friday, and it is still *sub judice*.

It can be said, however, that the Council definitely knows its own mind on the matter and favours a sweeping measure for public control in all cases.

Were the whole position of electricity supply being considered *de novo*, such proposals would no doubt have much to commend them, but as other types of organisation have given and are still giving proof of real effectiveness in the

A tea party: The Lord Mayor of Manchester, Mr. E. E. Hoadley, the President, and Sir Percival Bower

public interest it is being argued by those who are not engaged in municipal work that such bodies should still retain their identities. There is, however, a general consensus of opinion that too much importance should not be attached to the Government proposals at this stage. The companies have their own views on the subject and so have some of the smaller municipalities, which are still dissidents, and it is recognised that a reconciliation of legitimate variations of opinion among these several factors in the ultimate interests of the public will provide a thorny subject for debate both in and out of the House of Commons.

So far as can be ascertained from discussions which we have had with them, manufacturers welcome the principle of larger areas of supply. Among other things, it would tend, they suggest, to bring about standardisation of material (*e.g.*, in the present unnecessary variety of conductor sizes in cables) and would improve the chances of contracts being placed on a basis of quality of performance rather than on the acceptance of the lowest tender, which, they say, is often quoted as a result of a lack of experience.

MONDAY.

To-day began with the issue of badges at the Convention office in the entry to the Dome. Delegates, anxious no doubt to secure as much time as possible in the abundant sunshine on the sea front before the more serious business of the week started, were early off the mark. But not so early as Mr. Allen West and his attendant nymphs who took toll, as gladly given as gracefully received, of the constant stream of members and visitors throughout the day. The aim of the collectors was, of course, to increase the funds of the Electrical Industries Benevolent Association, and one found also that the Derby would be used for furthering the same cause.

In addition to the badges, lists of delegates, exhibition programmes and E.I.B.A. flags, there was a perhaps unwise distribution of a handbook to Brighton—unwise because the illustrations of what the town and its neighbourhood have to offer in the way of counter-attractions to the official programme may influence undue attention to the amenities.

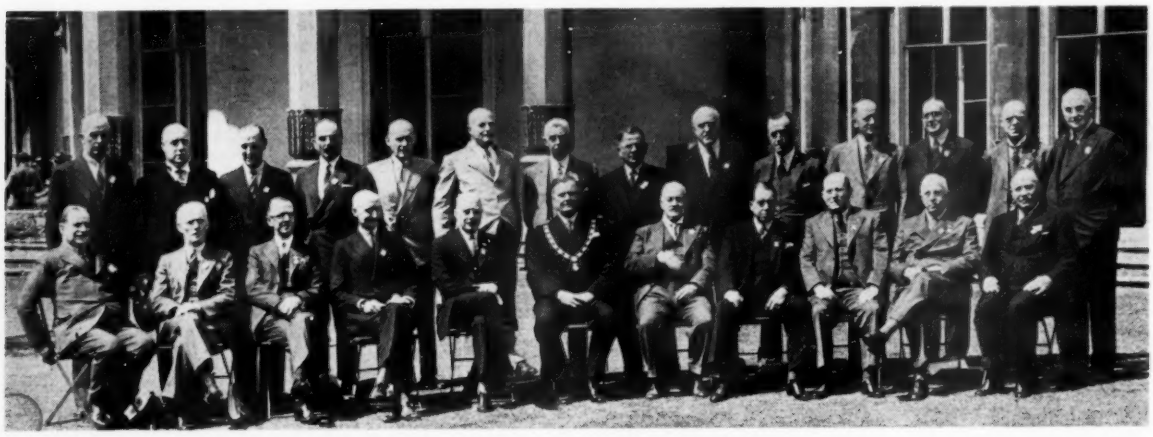
Best of all, however, is the opportunity offered in this opening stage of the Convention for chance meetings of old friends and colleagues with reminiscent talk of foregatherings at previous conventions or in work in earlier years and the lighter

A crowd at the Exhibition and, right, the President, the Lord Mayor of Manchester, Sir P. Bower, and Mr. V. W. Dale at the E.D.A. stand

Caught by our Cameraman at Brighton

1. Mrs. K. Pocklington, Mr. A. Nichols Moore, Councillor H. G. Barter and Mr. O. H. Buckingham. 2. The President with the secretary (Mr. J. W. Simpson). 3. Messrs. R. & G. Berry with Mr. W. N. C. Clinch, the Brighton engineer. 4. Ald. W. Walker, Mr. H. C. Lamb, Mrs. J. D. Peattie and Mr. E. Seddon. 5. Messrs. R. W. L. Phillips and J. G. Kellie 6. Ald. J. Chuter Ede, M.P., Miss D. Vaughan and Miss C. Haslett, C.B.E. 7. Councillor H. B Vorley and Mr. C. W. Salt. 8. Mr. J. M. Kennedy (Electricity Commissioner), Mrs. Kennedy. Mrs. G. Z. de Ferranti and Mr. E. E. Hoadley. 9. Messrs. A. J. Newman and F. L. Humber with Mr. and Mrs. C. W. Bridgen. 10. Messrs. P. J. Robinson and B. T. Hawkins. 11. Mr. and Mrs. J. Entwistle. 12. Capt. J. M. Donaldson. 13. Mr. W. C. Bexon welcomed by E.D.A. (Mr. A. C. Cramb). 14. The President and Mrs. R. Ferguson take a ride. 15. A South Wales contingent

moments of yore that were not directly concerned with work—reminiscences that do not preclude the exchange of notes as to what each is doing now and discussions of schemes in hand. It is also pleasing to note that those who have lived



The official photograph of the I.M.E.A. Council.

the most active lives seem the least touched by time and that many a "veteran" retired from service compares well in vigour with his younger confrères.

In the grounds at the back of the Corn Exchange were prominent one of the Excel travelling show vans, which we were

The electric vehicle parade

informed are most successful business getters in their tours about the country; the Jackson Stove Co.'s demonstration van; and a similar vehicle of the Brighton Corporation.

Only round the corner from the grounds is the showroom of the local undertaking with its fine corner site. Of the load-building activities of Mr. W. N. C. Clinch, the engineer and manager, we wrote in our last issue, but the more superficial aspects of energetic development are seen in the fairy lamps which make the trees at night take their share with the coloured floodlighting of the Pavilion and other Convention buildings and the brilliantly light-decorated tramcars in adding to the carnival spirit. Two examples of illuminated water-spray effects give one to wonder why very much more use is not made of fountains in this way.

This afternoon the exhibition was opened by the Deputy Mayor (Councillor Denny) in the absence of the Mayor through illness. He compared the present display of some eighty firms on attractively arranged stands with the twelve tables occupied when the last I.M.E.A. Convention was held at Brighton. The President, in calling upon the Deputy-Mayor to address the gathering, congratulated Mr. Dale and the E.D.A. and I.M.E.A. officials in having built the stands in record time. A vote of thanks to Councillor Denny was proposed by Sir Percival Bower.

This function was performed in the Dome, as the Corn Exchange was too well occupied by the exhibits to leave an adequate open space for all those who attended. Although the exhibitors have had to be content with a smaller space allowance than that available on some previous occasions, they seem to have adapted themselves very well to the circumstances by giving good representative displays without the appearance of overcrowding.

TUESDAY.

Last night's function, the reception by the President and his daughter (Mrs. R. E. G. Ferguson) was a great success. The two ballrooms at the Pavilion were good, but better still were the grounds in which the guests were free to wander. A cabaret of a quality distinctly above the ordinary was presented in the Dome, entry to which was made on this occasion by the subterranean passage built by George IV. One item of news gleaned from Mr. E. E. Hoadley during the evening was the birth of a daughter fifteen days before.

The civic welcome usual on the Tuesday morning of a Convention could not be extended by the Mayor (Councillor J. Routley) from the platform owing to his unfortunate illness.

The President (Mr. Frank Forrest) delivering his address on Tuesday

but although we were unable to see him, by the aid of electricity we were able to hear his voice clearly in his short address from his sick bed.

The point in Mr. Forrest's presidential address that received most applause was his reference to the desirability of public control of distribution and his deprecation of a delay of fifty years in transferring the companies to this form of administration. (It is only fair to state, however, that we met municipal engineers who hold different views.)

A runner-up in interest was his condemnation of the present unsatisfactory methods of coal purchase under the Coal Mines Act of 1930. This should appeal to all undertakings, whether owning selected stations or not, as in the latter case any increases are automatically handed on to them by way of the grid tariff. Some delight was expressed at Mr. Forrest's neat phrase regarding academically trained men without enough works experience as a "little over-educated for their intellect"—a viewpoint that drew from Alderman J. Chuter Ede, when proposing the vote of thanks to the President, the pertinent remark that the type of mentality envisaged was due to a wrong kind of education rather than to too much.

Afterwards, the ladies having retired to take coffee with Mrs. Ferguson, the residue inspected the fleet of sixteen battery-propelled vehicles assembled in the Pavilion grounds.

A notable feature is a six-wheeled chassis. This is one of six models shown by Murphy Cars & Trucks, Ltd., which also included a three-wheeled invalid's chair and four delivery vans. The three Metro-Vick models include a 10-14 cwt. chassis with a six-speed controller and a streamlined service van lent by Finchley Borough Council. A "Clecolectric" 10-cwt. delivery van exhibited by P. W. Taylor has an all-steel body and mercury tilting controller contacts.

This afternoon we met in the Dome once more to hear the paper on "Electric Thermal Storage" which Mr. W. C. Parker read in abstract, while Commander F. J. C. Allen described the main features of the examples of installations thrown on the screen. The discussion proved to be a lively one and indicated differences of opinion that fully justified the choice of subject. Fault was found with the economics of the case made by the authors, but there is evidence from the history of our industry (*e.g.*, in electric lighting) in favour of Mr. Parker's submission that in future the more obvious economic factors will not play the same part as they do now.

Although it would be a disservice to electrical development to try to push electric heating when the conditions are unfavourable to success, debate among those able to discriminate in such matters will no doubt tend to reduce the number of cases regarded as unsuitable. For this and other reasons the suggestion by Mr. J. W. Burr—a pioneer in this field—that differences of opinion should be kept for private discussions would not appear to be to the ultimate advantage of electrical methods. Regarding the question as to whether off-peak consumers ought to contribute towards overhead charges, the answer is surely that in this case they do. The provision of storage (especially when the hours of use can be controlled by the undertaking) is equivalent to the possession of an equivalent amount of plant by the supply authority. An analogy would be the provision of local storage batteries at points in a network to level out the electrical demand.

The Deputy-Mayor and the Mayoress of Brighton receive the President

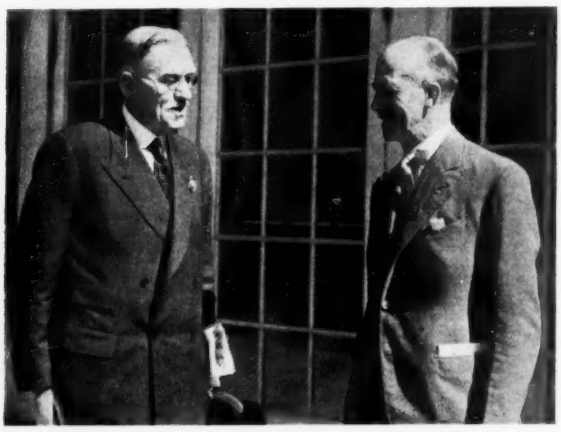
Top left: Ald. Sir John Inskip greeted by the President. Top right: at the dance after the Deputy-Mayor's reception. Bottom left: Mr. W. C. Parker reading the "Thermal Storage" paper. Bottom right: Listening to the presidential address

Delegates arriving for the Wednesday morning session

WEDNESDAY.

Last night was the Mayoral reception at which the Deputy-Mayor officiated. A sharp drop in the temperature prevented much use being made of the Pavilion grounds but the building was big enough to hold the large gathering.

This morning's business opened with Alderman Huntsman's paper on the committeeman and his duties. Evidently there is a strong feeling in favour of the long term of office of chairmen advocated by the speaker. It was pleasing, also, to hear



Alderman Huntsman chatting to Mr. C. G. Morley New (Electricity Commissioner)

the audible recognition given by the delegates to his reference to the work of Alderman W. Walker, especially in staff matters. Those present, too, were evidently in full agreement with the suggestion that such an organisation as the I.M.E.A. would always be necessary, whatever changes were in store.

During the discussion the presence of a strong (and vocal) proportion of those who believed that amalgamation would not be the most desirable way of stimulating electrical progress was made evident.

An interesting discussion followed this afternoon's paper on "The Development of Electricity Supply in a Rural Area," by Messrs. V. A. Pask and R. W. Steel, of Norwich (abstracted on page 838). The subject is full of problems and one which is now having to be faced in many parts of the country. Suggestions put forward are likely to be of great assistance in avoiding pitfalls in the future. Attendance at this session was not quite as good as it might have been owing to the counter-attraction of the Derby. Incidentally it was appropriate that the winners of the E.I.B.A. sweepstake included the local borough engineer, Mr. W. N. C. Clinch.

Messrs. L. Romero, R. W. L. Phillips and John Christie (former Brighton engineer)

THURSDAY.

Arrangements for to-day include the paper on "Domestic Electrical Refrigerators," by Mr. W. F. T. Pinkney and Mr. A. J. Ryan (see page 841); a lunch organised by the Electrical Association for Women; an afternoon reception by the President at the Exhibition; and the annual banquet and ball at The Dome.

To-morrow (Friday) there will be an I.M.E.A. Council meeting at 9.30 a.m., followed by an extraordinary general meeting (10.15 a.m.) to amend by-laws and the ordinary general meeting (10.30 a.m.). In the afternoon an excursion to Shanklin is planned, starting at 2.30 p.m. and returning about 9.15 p.m. There will be an informal dance at the Grand Hotel commencing at 9 p.m.

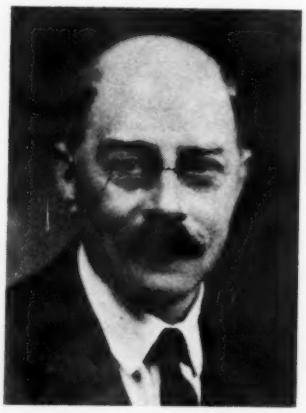
All the photographs used in this report and others elsewhere in the issue relating to the Convention were taken by our own photographers.

The President-elect

THE democratic nature of the I.M.E.A. is demonstrated by its choice of presidents. It is not only the chiefs of the largest undertakings who are elected to this important position. The smaller undertakings also get their chance and this year the choice has fallen upon one of their number—Cheltenham, in the person of Mr. W. J. Bache, who is the electrical engineer of that health-giving borough.

Mr. Bache's election is particularly appropriate just now when the fate of the smaller undertakings is uncertain—although Cheltenham is just above the ten-million-unit line which the McGowan Committee drew between the larger and the smaller concerns.

The new president has occupied his present position for the last twenty-two years. He commenced his technical training at Faraday House, London, and then served a term as a premium pupil in the Madrid electricity works. Returning to England he became a cable-testing assistant with the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (the "Silvertown Company") and later went to the Leeds electricity works as charge engineer and technical assistant.



[Lafayette

Mr. W. J. Bache, President-elect of the I.M.E.A.

Then, after serving for some time as engineering clerk of works to Robert Hammond & Son, he was appointed city electrical engineer of Gloucester, moving in 1905 to Cheltenham to take up his present position.

At this time the Cheltenham undertaking was regularly incurring a considerable loss each year. Mr. Bache had the task of reorganising the undertaking and increasing its output to make it a profitable concern. Within two years the turning point was reached and since that time the undertaking has continued to progress. In recent years the supply has been extended to the rural area surrounding the borough.

The Electricity Commissioners "Return of Engineering and Financial Statistics" for 1935-36 show that Cheltenham (which is now a purely distribution undertaking in the S.W. England area) sold about 12 million kWh to its 11,835 consumers, giving an average of 188.2 kWh per head of population.

Mr. Bache is a member of the Institution of Electrical Engineers; he joined the Institution as an associate in 1904. He has served as chairman of the Western Centre.

The Presidential Address

Delivered by Mr. Frank Forrest on Tuesday morning

SPECIAL engineering developments in the Birmingham electricity undertaking, of which Mr. F. Forrest is chief engineer and manager, formed the subject of most of his presidential address. Birmingham's is the largest municipally owned undertaking in Great Britain. It serves an area of 195 square miles, with a population of just over one million. There are 225,000 consumers, and the maximum load is 265,000 kW. The energy sold annually totals 708 million kWh, and the gross revenue was £2 millions during the last financial year.

The Corporation owns two "selected" generating stations (Nechells, containing 131,000 kW of plant, and Hams Hall, containing 240,000 kW, *i.e.*, three 30,000-kW and three 50,000-kW sets), both of which have to use cooling towers for their condenser water. The undertaking is to this extent handicapped in the contest for improved thermal efficiency, which is 23.5 per cent. at Hams Hall. But, says Mr. Forrest, a low works cost is more important from the commercial point of view. In 1936 at Hams Hall this was 0.109d. per kWh (coal 0.091d., wages, salaries, repairs and maintenance, &c., 0.018d.).

The handicap imposed by the compulsory use of cooling towers, and the lower engine-room efficiency occasioned thereby, has made it more important to concentrate on boiler-house and combustion efficiency. With this object pulverised coal has been largely used at Hams Hall and has proved to be very successful. Its many advantages include ease of control and ability to cope with sudden fluctuations in the demand for steam and a slightly better efficiency of combustion with less unburned carbon in the residual ash, combined with the greater range of fuels that can be efficiently utilised.

[*Lafayette*

Mr. Frank Forrest, President of the I.M.E.A.

But a very real disadvantage is the emission of almost impalpably fine dust from the furnaces, which cannot be trapped on its way to the chimneys in any of the usual types of mechanical or centrifugal dust collectors. Consequently, electrostatic precipitator plant, combined with very tall chimneys, had to be provided. The contractor was required to guarantee that the efficiency of dust collection should be not less than 92 per cent. when operating at full duty, and as the electrostatic precipitator operates in series with the original centrifugal-type dust collectors the total efficiency of dust elimination between the boiler and the atmosphere is rather over 97½ per cent. Two brick chimneys, each 350 ft. high and 20 ft. internal diameter at the top, are now in service, and the plant has now been in operation for more than twelve months; it has proved very successful and the guaranteed efficiencies have been slightly exceeded.

Plans are now being prepared for a new generating station on the same site, to be known as Hams Hall B, which is to contain 300,000 kW of plant; the first section is to be put into operation in 1941.

Street Lighting

A very extensive street-lighting scheme by means of discharge lamps—one of the largest ever carried out by any authority in the country—is now approaching completion in Birmingham. It covers approximately 127 miles of main and secondary roads previously lighted by gas. The scheme includes lighting the main roads by 400-W and secondary roads by 250-W mercury-vapour discharge lamps, spaced about 70 yd. apart and 25 ft. in height. The results obtained have been excellent and give great satisfaction to the public, and especially to the road users, who are now more inclined to use well-lighted secondary and ring roads and so relieve the congestion on the main roads and city streets. Experience has proved the suitability, reliability and great economy of this type of lamp.

After most careful investigation into the relative merits of various alternative means for the heating of the first section of the new Civic Centre buildings in Birmingham, the City Council, with the full approval of the Minister of Health, has decided to install electric thermal-storage plant, which will be one of the largest in England. It will be of 1,500-kW capacity, but as further sections of the Civic Centre buildings are erected the plant may gradually be increased in the future. Mr. Forrest is convinced that this system of heating will gain in favour, especially for city offices and central city premises.

Up to about six years ago the Birmingham undertaking was almost unique in so far as its electrical system did not conform to any of the recognised national standards. The alteration of frequency and simultaneously the transmission-line voltage and distribution system has now been successfully completed, and owing to its magnitude deserves to be recorded as a footnote to the history of the industry. The change of frequency necessitated the rewinding or replacement of a.c. plant totalling 1,105,000 kW, and two generating stations (Summer Lane and Nechells temporary) containing 62,000 kW have been shut down and scrapped. While the first cost of an 11,000-V cable laid and jointed is about 10 per cent. more, it can transmit 100 per cent. more power than a 5,500-V cable having the same size conductors. Fewer cables and switches are required. All expenditure attributable to this change of voltage has been borne by the Corporation and, while heavy, will soon be recovered by the extra efficiency of operation and economy in capital expenditure made possible by the change.

Meanwhile normal development proceeded without slackening, and during the change-over period (some six years) the number of consumers increased from 99,000 to 225,000, the maximum load from 160,000 to 265,000 kW, and the kWh sold from 360 millions to 708 millions.

Staff Recruitment

The carrying through of a task of this magnitude and peculiar difficulty was rendered possible only by the whole-hearted loyalty, technical skill and dogged perseverance of a first-rate body of engineers and workmen. The recruitment of the best type of young men into the service is a matter of first-class importance. The standard to which they must conform should be set high, for they must be made aware that they are entering not a trade but a profession, with a high and exacting code of honour and integrity.

In Birmingham young men are recruited as "trainees"; they are guaranteed two years' employment and are paid meanwhile a wage equal to that of a skilled artisan. These men must either have had a full term at a university and obtained a degree in engineering, or, alternatively, they must be up to matriculation standard and have served three years in an engineering workshop. Vacancies in the junior positions and occasionally for positions of superior responsibility on the technical staff are entirely filled from the trainee class.

As a result of long experience Mr. Forrest has a distinct preference for those who have had a works training, which broadens their outlook. Endeavour is also made to exercise the same care in choosing skilled workers, such as turbine drivers, stokers and jointers, all of whom are required to pass a *viva voce* and practical examination, and if successful are certificated. The men value the possession of these certificates very highly.

The Electrical Association for Women has placed the industry under a great debt and now the onus falls on the industry itself to provide further facilities that will turn the educated demonstrator into an experienced one. Every showroom in the country should accept one girl with the necessary theoretical training, and give her the opportunity of at least a year's practical experience. During that year a reasonable salary should be paid.

Legislation

The excellent little Electricity Supply (Meters) Act, 1936, was passed into law with quite unusual promptitude, and a position which was extremely serious to all supply authorities was thereby rectified. But almost every year some new legislation is introduced and an early opportunity should be taken of consolidating the various Electricity Acts into one up-to-date enactment.

The present position with regard to the purchase of coal is very unsatisfactory and gives rise to grave anxiety. Competitive methods no longer operate. The Coal Mines Act requires drastic amendment, and at the earliest possible date, to ensure a greater degree of protection to the purchaser.

During the past few years a silent but far-reaching industrial revolution has taken place in this country. We are now living in a competitionless age of price rings and cartels and quotas, so that advertising for tenders is becoming an expensive farce.

The eagerly awaited Report of the Committee on Electricity Distribution of May, 1936 (commonly referred to as the "McGowan Report") is a model of its kind.

The Report does not state a time limit for the complete standardisation of systems and voltages. Mr. Forrest considers this to be a matter of paramount importance, and it should be effected within a period not exceeding ten years from the present date, and should be a direct charge upon the individual undertakers. He is in general agreement with the proposals contained in the report with regard to the standardisation of methods of charge and for further extension of facilities, including supplies in rural areas, reduction in costs, and various miscellaneous recommendations.

Regarding organisation, Mr. Forrest is in full agreement with many of the recommendations, particularly as regards compulsory amalgamation of smaller undertakings into a larger single entity. When, however, he turns to the proposals for forming these larger distribution areas, agreement with the report as far as he is concerned comes to an end.

It may perhaps not be surprising that one who comes from Birmingham should declare himself as being entirely in favour of public ownership and public control of electricity supply. It would appear that some local authority undertakings may be transferred compulsorily to companies on what Mr. Forrest considers to be totally inadequate terms (with, of course, a right of appeal to the Minister of Transport and to Parliament).

In his view it would be wrong to allow companies to continue to control the supply of electricity in large areas of the country for any long period, let alone half a century, no matter what statutory financial safeguards are included in the Act. Furthermore, it would be very wrong to hand over local authority undertakings, except by agreement, to companies (some unfortunately controlled by foreign capitalists) and thereby allow them to consolidate further their control of the great service which can so profoundly affect the lives and well-being of large communities. Companies took the risk, they blazed the trail and developed the supply. Great credit is due to them for that. Their compensation should be adequate, but the adventure is over and it is now time the public took control.

The I.M.E.A. proposal is the setting up of Distribution Boards founded on public control in all areas. Where this is not practicable the alternative suggestion is to amalgamate smaller undertakings with larger municipally owned undertakings and, in certain areas, to form Joint Public Authorities. He fully concurred with these proposals.

The difficulties, technical, financial and administrative, in effecting the ultimate transfer from company to public ownership as foreshadowed in the Report, will increase as time goes on, and in Mr. Forrest's opinion it would be better to face boldly the issue now rather than to wait for an indefinite number of years, with the added complications which are bound to arise in the interim.

Thermal Storage Heating

Presented by Cdr. F. J. C. Allen and Mr. W. C. Parker at the Tuesday afternoon session

THE authors' main object is to present such facts as will encourage the belief that thermal storage load, under the right conditions, is a desirable one for electricity undertakings. They confine themselves to the broader principles, supplemented by an appendix of examples of various installations in different parts of the country, coupled with a warning that text-book figures should be treated with some diffidence, since in practice circumstances have a material effect on theoretical calculations.

The B.th.u. outputs obtainable from various forms of energy show that electricity at 0.25d. per kWh is cheaper than gas at 8.5d. per therm, and to compete with coal and coke it would appear that electricity must be available at 0.062d. per kWh. But this is an entirely fictitious figure, because the efficiency of thermal storage plant is stated with confidence to be about 97 per cent., and the use of electricity does not confine the whole of the boiler plant to one position.

Again, night load periods, which reduce the load factor and involve banking the boilers, etc., may reduce the overall seasonal efficiency to 25 per cent. This taking of apparatus efficiency into account means that 0.062d. becomes 0.25d. per kWh, which is a possible figure for night load.

[Elec. Rev. photo.

Commander Allen (left) is chairman of Bastian & Allen, Ltd., and Mr. Parker (right) borough electrical engineer of Fulham

The fact that electrical thermal storage can effect considerable savings in building costs seems in many cases to be ignored. Such plant can be installed in space which cannot otherwise be usefully employed, or where foundations adequate for solid fuel plant cannot be provided. Such considerations as these are becoming daily more acute in congested areas, where tall chimneys and grit arrestors, etc., may also be insisted upon if solid fuels are used.

These factors are not nebulous; they have a material effect in enabling electrical propositions to be put forward competitively without the necessity of offering extravagantly low prices of energy. The first consideration should be the all-in cost of electricity for all services required. This creates enthusiasm for additional uses (cooking, &c.), which might not otherwise be considered.

A typical example worked out in the paper indicates a saving over coal of £91 per annum at tariffs which can be considered by any supply undertaking. It is emphasised that 60 per cent. of the kWh used is consumed at night, and in areas where the standard tariff for industrial loads during the daytime period is only 0.5d. per kWh.

Thermal storage is of interest electrically only as a load; that is as a means of increasing the output of electricity and facilitating the extension of its uses for other purposes. The supply authority does not have to provide any special apparatus or costly cabling. Providing it does not increase the maximum demand on the system, energy for this purpose could be at the actual cost of purchase, or production, plus a very slight margin.

In South-East and East England under the grid tariff at the basic coal cost night load can be purchased for 0.21d. per kWh. This has enabled recent thermal storage schemes of from 100 to 200 kW to be based on 0.25d. per kWh.

Larger installations, say, consuming a million kWh per annum or more, cannot be justified at this price. But the authors state authoritatively that the Central Electricity Board, with the approval of the Electricity Commissioners, will consider special night tariffs, provided that the authorised distributor purchases the whole supply required for his undertaking from the Board at the grid tariff; that the cost to the authority of taking and delivering the off-peak supply is at a tariff greater than the price at which it is able to meet the competition of fuel or gas; and that the supply is of substantial magnitude for the particular building and the conditions justify the use of electricity for the purpose. Under such conditions and subject to the Board's being satisfied that the rate offered by the undertaker is not lower than it need be, it is understood that the C.E.B. would feel justified in putting an undertaker, buying at the grid tariff, in a position similar to that of the owner of a generating station, who would be able to improve his running conditions by accepting, within certain limits, off-peak load. Therefore, by getting some slight concession from the Board in suitable cases undertakings are in a position to accept thermal storage loads at a small financial benefit to themselves, and at a large general benefit to the undertaking as a whole.

The authors stress very emphatically that, although certain low rates are often put forward by advisers (interested in fuel and gas heating, and even by authorities for loan sanctions) as the limit to which electric heating on a large scale can compete, yet experience has shown that there is quite a wide variation between the prices which users, properly advised, will and can pay according to the character and use of the building in question. In other words, the more one knows

about the problems of thermal storage and the heating of buildings, the more can one put forward the many advantages of electricity over any other type of fuel, and show substantially why, apart from pure £ s. d., the consumer should pay with a true perspective of all the value that he is obtaining from electric thermal storage.

Electricity sold in off-peak hours will only cover the cost so long as the supply does not increase the undertaker's standing charges. It must be regarded as a special line, without commitment to extend or repeat. Therefore, it is neither necessary nor desirable to establish standard rates for such supplies. Every case should be considered not purely as a thermal storage system, but by the total loading and revenue to be obtained from the prospective consumer for all purposes.

The second part of the paper is a comparative review of installations. Table I shows the total connected loads (a.c. electrode boilers) respectively for heating buildings, swimming baths, etc., and for small industrial process steam generation.

TABLE I.—CONNECTED LOAD, kW.

	Gt. Britain.	Switzerland.	Italy.
Heating	90,000	54,000	67,000
Steam	8,000	120,000	208,000

With coal- or coke-fired boilers maintenance is about 7 per cent. per year, taking all labour costs into consideration, while the maintenance of electrode boiler plant has been proved by experience to be not more than 2 per cent.

The third part of the paper is concerned with heat losses and similar calculations, and radiator, embedded panel and plenum systems of heating are briefly referred to. The fourth section describes the primary boiler and secondary heat controls. It is explained that distant control is not so much additional as alternative. It is desirable when the supply authorities do not wish to cut off the entire load at any particular hour, but prefer themselves to keep control of the load so that part or all may be given to suit the condition of their supply. It consists mainly of a change-over switch from local to distance, the load regulation and on-and-off switch being duplicated. In England, with sudden fogs and so on, such an arrangement is very convenient and elastic because it is very often unnecessary to cut off the entire load and the consumer can have the benefit of part load when he wants it.

Five well-known cases in London are: Messrs. Peter Jones, Ltd., Chelsea, where three 750-kW boilers can be controlled either in the building or in the Chelsea Electric Supply Co.'s station; Chesil Court flats, two 500-kW boilers, supplied by the same undertaking; the Princess Beatrice Hospital, 100- and 500-kW steam and one 1,100-kW hot water boilers; the Capitol Cinema, Haymarket, 300 kW; and Earl's Court, where three 11,000 V boilers of 4,000 kW each can be controlled from a distance of some 2¼ miles. By this means absolute control is obtained over the peak, and not control fixed arbitrarily by a time switch which may in unusual circumstances, such as the coincidence of fog and frost at the worst period of the day, actually miss the peak.

Storage Not Always Necessary

The size of the storage depends upon the number of hours for which heat must be supplied when electricity is not available, and if the prohibited period is reduced to two hours between, say, 4-6 p.m., as is not uncommon, it may be quite possible to do without any storage at all, there usually being sufficient storage in the system to tide over this period. In this respect the hot-water electric system has a distinct advantage over the direct electric system which, in itself, has no heat reserve whatever, and, furthermore, with a hot-water system the temperature of the radiators can be lowered or raised as required.

The fifth part of the paper deals with consumption, based on records kept in many buildings which have been heated in this way for a number of years. After the first few years during which the building is drying out the consumption falls appreciably. The method of calculating estimates, therefore, merits consideration.

Discussing the provision of domestic hot water, the authors stress the importance of deciding that premises shall be "electric" before they are built. Also they show how open-air swimming pools can be heated electrically with great advantage over any other method. Indoor and open-air pools do not differ greatly, but the authors indicate how differing circumstances may cause estimates of consumption to be misleading if they are based on text-book figures.

The sixth part of the paper briefly describes a number of electrode steam boiler applications, both for heating and for processing work in factories, on farms and dairies, laundries and for sterilising in hospitals. Typical steam boiler running costs are £1 per week for 70 kW in a small hospital laundry; 4s. per day at 0.5d. per kWh for 25 kW in a dry cleaning establishment; £7 per week for 150 kW in a factory (the boiler being placed on the fourth floor where it would be difficult to accommodate any other type); a 120-kW boiler in a mineral water factory, at ¾d. per kWh, shows a saving of 15 per cent. on fuel and labour previously used. An evening peak cut-off or two-rate meter arrangement is usual in such cases as these.

Although there seem to be great possibilities, little attention appears to have been given to the combined use of coal and electric plant, so that the coal can be used during the day when labour is available and electricity at night when the opposite conditions prevail, thus obviating the necessity of the capital cost of storage. One of the first jobs of this kind is probably that of Messrs. Robert Hornby & Co., Ltd. The problem was to maintain a fixed temperature at night in the meter-testing rooms and the minimum temperature over the whole building. This was achieved by installing a 60-kW electrode hot-water boiler in parallel with a coke-fired boiler, so that when the temperature falls the electric boiler is automatically switched on. Superimposed on the electric boiler control is a local thermostatically controlled valve in the meter rooms. The plant has been working for many years now with entire success.

Mr. Allan Falconer, parks superintendent and secretary, Ashton-under-Lyme and Stalybridge, has a similar arrangement for maintaining the temperature in his glass-houses at Stalybridge. Similar requirements were met by Messrs. J. H. Fenner & Co., Ltd., Marfleet, Hull, belting manufacturers, by means of local air heaters operating during the night when the coal steam boiler is shut down.

There must be many places such as have been described where the advantages of being able to maintain a temperature will more than outweigh both the capital cost and the cost of running, which depends usually on the intelligence displayed in operating, and the skill with which the coal-fired boiler is worked.

Two Fulham Schemes

Although electric boilers or thermal storage are not used, two unusual jobs in Fulham are of interest. The first is the Fulham central sub-station, the heating of which is provided by the no-load losses from the transformers, which amount to about 50 kW. This heat is transferred to the building by ducts and fans with arrangements to divert the heat to the open air when the desired temperature in the sub-station is reached. By this means even conditions are maintained in summer and winter, irrespective of those outdoors. The control room in the centre of the building has a special ventilating arrangement with a 30-kW air heater, which was necessary as the transformer losses would normally be insufficient in cold weather for the whole requirements.

The second installation is in Council flats where the tenants wash their clothes in their flats and bring them to an electrically heated drying room situated in the courtyard. Costs come out very well with the estimate, which was put forward in competition with gas, and for 189 flats the electricity consumption works out at approximately 5 kWh per flat per week, which includes the electricity consumed by the motors driving the fans.

Discussion

MR. W. C. PARKER (Fulham) read the paper in abstract, for which thirty minutes was allowed. Commander F. J. C. Allen (Bastian & Allen, Ltd.), then exhibited a series of lantern slides, with commentary lasting about twenty minutes, to illustrate how many really large buildings, as well as small, were already heated on the thermal storage system; including Earl's Court Exhibition, where there was 12,000 kW of night load and the tariff was 0.5d. per kWh. This will be the largest installation of its kind in this country.

The discussion was limited to one hour, five speakers taking part in it, apart from the reply. The first speaker was MR. W. J. BACHE (Cheltenham), president-elect. He said there was a great deal in this paper that would be very helpful, but the authors seemed rather to labour the subject of tariffs. They appeared not to have made up their minds whether to advocate the system on the ground of its cheapness or of its other advantages. The latter were many and would alone justify the method rather than attempts to obtain the lowest, and sometimes fantastic prices, for energy. Energy should be available more cheaply for large installations (contrary to the authors' belief) because it would probably be delivered at high voltage.

Automatic control and heat losses assumed more prominence in large plants, while other advantages such as reduction of labour costs and saving of space were also greater in the case of large installations. The authors' comparison of electricity with coal was, due to the method of calculation they had used,

dangerous and might have been better omitted. The inclusion of so-called typical winter load curves was a mistake; they did not seem to be typical and were misleading as they only told half the story. In the speaker's opinion oil-fired systems were a much more serious competitor than coal. The authors would have done better to concentrate on advantages other than cheapness.

MR. H. C. LAMB (Manchester) regretted that more space had not been given in the paper to the economics of this class of off-peak business. He considered the field for this type of heating to be in the centres of large cities and towns, many of which were subject to spells of frost, for which reason he found "typical" load curves misleading. If such loads were not to be charged with overhead costs, then they must be outside the maximum demand periods in winter. He exhibited actual load curves for a foggy day in December in Manchester to show how thermal storage was causing the mid-day peak to grow and so made it very difficult to refrain from charging such loads with overhead costs.

Mr. Lamb also gave details of some large installations in Manchester, one of them of 5.25 million cu. ft. storage capacity, to indicate that the municipality was satisfied on a purely business footing that thermal storage was the best form of heating for the particular purpose. He was against the indiscretion of quoting too low prices, and in Manchester they "stuck out" for 0.25d. per kWh, which allowed about 10 per cent. as a contribution to the general charges. Thermal storage load was not justified unless a margin of that order was obtainable.

BAILIE MRS. J. ROBERTS (Glasgow) said that those who made unfair comparisons with coal and gas were doing a dis-service which would recoil on the electric heating industry. She was astounded at the authors' deductions based on comparisons with coal at 40s. per ton. In Glasgow they were protesting at a coal price of 17s. per ton. Also in considering labour costs the authors did not seem to realise that coal boilers could be automatically stoked.

All kinds of electric heating systems were pioneers and, as such, might soon be out of date. Therefore, the capital cost of something that might have a relatively short life needed very careful consideration. The thermal storage installations in Glasgow were not comparable, because a preferential tariff was offered as a form of propaganda; while the authors had not told the whole story, for they had not mentioned the 3-kW heaters that they had to add in the top portions of the building. There should be one rate only for all consumers of one class. She did not favour diversity of charges for any one type of consumer, for preferential and flexible rates always caused trouble.

MR. J. W. BURR (Swansea) recalled his advocacy of thermal storage seven years ago, remarking that the same arguments used then were still being used to-day. He said that he felt bitter about this matter, because at that time he was putting forward a scheme worth thousands of pounds. Statements made during the discussion of his paper caused local newspapers to appear with such headings as "Engineer's Paper Ridiculed." The result was that his scheme was abandoned, but, fortunately, he was later able to convince his municipality of the soundness of the proposal and it was carried out. He did not know whether Mr. Bache had any actual experience of thermal storage; no one without experience should publicly criticise figures without first carefully checking them.

MR. J. R. COWIE (A. Reyrolle & Co., Ltd.) said he spoke as a maker of thermal-storage plant, but in the past he had had to sell electricity and so could look at both sides of the subject. Every case must be considered individually and strictly on its merits. But he had no doubt that thermal storage would increase in importance and in due course become one of the "biggest consumers of units."

His leaning was toward regulation from a central point. For that purpose a discriminating type of relay was being developed for altering the loading electrode boilers could take according to the condition of the supply network. In addition, a special form of time switch was developed for switching the boilers off altogether at appropriate times. The authors' load curves were not so far from reality as some of the previous speakers had attempted to indicate.

Capital costs of storage tanks, piping and pumps were affected by longer-hour current consumption. The less restriction there was in that respect the smaller would be the initial cost. Encouragement at the beginning would ultimately benefit supply authorities and provide good business for manufacturers. Some installations had not adequate reserve capacity. Two boilers properly "clothed" would enable three-quarter loading to serve during overhauls.

In reply to the discussion, MR. W. C. PARKER said that the authors had expected criticism and they had had it. But he was quite confident that electric heating, in due time, would be insisted upon just as electric light was demanded to-day. As things were, £ s. d. came first and it was no good pretending otherwise. The other advantages alone of thermal storage would not carry it very far.

He could show Bailie Roberts actual contracts for coal at 40s. per ton which had been signed within the last few weeks. Similarly, other figures given in the paper could be substantiated. He had had his figures checked by the Central Electricity Board, by two unbiased and independent consulting engineers, and other authorities.

Regarding additional 3-kW heaters at the tops of buildings, he could only surmise that, being in Scotland, they had been somewhat economical with roof coverings. He could give a definite assurance that the plant would not soon get out of date, because the electrode boiler was so simple and specialised relays could be added at any time to modify control.

He entirely agreed with Mr. Cowie's remarks and also with the need for co-operation between manufacturers and supply authorities. Thermal storage was not a night load, but an off-peak load, and the supplier had a right to curtail it so that it could be given when it was most convenient (always providing the consumer was given proper service).

The Municipal Committeeman

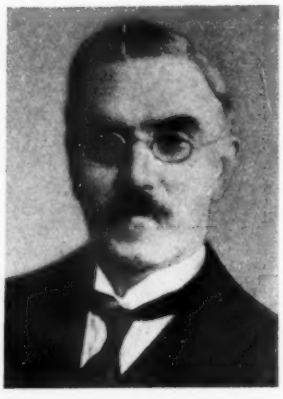
Paper by Ald. E. Huntsman read at the Wednesday morning session

THIS theme is treated of in a general way, the author being concerned more with the committeeman himself, his attitude toward his work and what, on certain subjects, his point of view ought to be.

Electricity supply by local authorities has reached a turning point. Every working part of their administrative machinery is receiving the closest examination. The committeeman himself, as an important part of this machine, is no exception. He has keen critics in high places who ask whether he is competent to carry out efficiently his great task.

Such disparagement of the lay committeeman as exists seems to ignore the fact that the part he plays is mainly—though it should not be entirely—administrative; and it is therefore by administrative standards and not technical ones that he should be assessed. He can point to the prodigious success of the industry under his administration. Lack of competence or of courage on his part would have held it back.

At present there is in some quarters a tendency to restrict the scope of his authority, but the author wishes him to maintain it, though he is not blind to committeemen's deficiencies. They are, for instance, often singularly weak in imagination. This narrows their outlook and makes them too prone to "run their own shows" with unconcern for what is taking place elsewhere.



Alderman Huntsman is chairman of the Nottingham Electricity Committee, and a past-president of E.D.A.

All the duties and responsibilities of committeemen rest also upon the chairman, but in an intensified degree, while there are some which are peculiarly his. His leadership should be effected, not by the bludgeon, but by the depth and width of his knowledge, by the soundness of his judgment, and by the definiteness of his policy. If frank and free discussions sow doubts in his mind, he must be ever ready to revise, and, if needful, abandon any of his previous conclusions. The author has little faith in "strong men"—mostly pig-headed—in the chair. A committee torn by lasting discord is in most cases a disgrace to the man who presides over it. Many chairmen are severe on the critic, and hasten to snuff him out. The inevitable result is that the sufferer becomes a soured and embittered source of trouble.

The committee is an instrument which is meant to settle policy by discussion and the chairman has also to be the mouthpiece of the committee before the Council and the public. To the engineer, who has little chance of being his own advocate, he owes special duties. The chairman should always see that he is not allowed to be the victim of injustice.

Standing orders which obtain in some corporations limiting the chairman's tenure of office to, say, three years, are not in the public interest. The idea that the chair is an "honour" which ought to go round is too childish for discussion.

The National and District Joint Boards and Councils are now firmly established and have deservedly won confidence on all sides. The good relations they have produced, and the peace they have ensured, mark them out as worthy examples to industry generally. Yet in this system there is a deplorable gap: there is no provision for the chief engineer. He was excluded from the Board at the instance of the employers' representatives. The reason for shutting him out was the perfectly sound one that if he were an active member of the staff organisation his authority might be weakened by divided loyalties. The time has now arrived when the chief engineer should have an organisation of a representative kind to ensure just remuneration and satisfactory conditions.

What is wanted is an organisation on the lines (*mutatis mutandis*) of the Joint Boards. The payment of salaries that are inappropriate is not due to any deliberate intention to underpay. It is mainly due to salaries committees which are generally unfamiliar with the standards obtaining in the electrical industry, and are concerned to keep the electrical engineer's salary equal to or below the salaries they pay to chiefs in less exacting departments—a consideration which is really more or less irrelevant. Under-payment in the municipal branch has deprived it in the past some of its most capable engineers.

In the keenness of our local patriotism we are all alike in danger of falling into an excessive devotion to the "Parish pump." In paragraphs 53-83 of the McGowan Report the facts of the case are set out beyond dispute. Those paragraphs exhibit a tangled jungle through which no progress at a satisfactory pace is possible. The path must be cleared, and in Ald. Huntsman's view the Report demonstrates conclusively the necessity for a survey of all distribution areas, large and small alike, with a view to re-shaping them as may be determined mainly or solely by the technical and commercial requirements of electricity supply. Up to now electrical considerations have been subordinate or accidental in the drawing of the boundaries of distribution areas.

Mergers are proposed. The proper aim of every experienced committeeman is ample and efficient service for his consumers. His supreme responsibility is to see that *they* get the maximum of benefit. The provision of a full range of services and facilities for making those services available to all classes is a business which demands a good and well-paid staff and the command of considerable capital, and some undertakings, just because they are small, cannot command these resources. Further, a thousand economies are possible in businesses conducted on a large scale which are unattainable when the scale is small. These considerations afford sufficient ground for the grouping of small undertakings, or the wedding of them in some cases to larger ones which may happen to be near at hand. It would not be entirely right to think of this process merely as an extinction of the smaller entity, but, though a certain loss of individuality is involved, and may be regretted, it may more justly be regarded as a joining of forces for the better achievement of a common purpose.

In the existing circumstances one's preference for public ownership affords no good reason for resisting the scheme. Companies are entitled to fair and reasonable treatment on the same footing as municipalities. Whether it will be possible to secure in any effective form to the transferring authority a share in the future administration of the enlarged area is a point worthy of serious attention. Perhaps the most that can be hoped for is the setting up of consumers' advisory committees.

Many gas and finance committees of late have developed a thirst for what is labelled "co-ordination." The author regards this as a grave danger to progress. Finance committees favour it as a means of safeguarding capital invested in gas, and gas committees regard it as a means of checking electrical advance.

Committeemen, as administrators, should have the largest range of powers, with little or no interference from outside. The author does not hesitate to describe their present situation as the weak point of municipal control. The best plans of a committee may be ruined by an uninformed council.

Nottingham Corporation is one of very few which have, and exercise, a statutory power to make a complete delegation at the beginning of each year to each of its committees in its own sphere. Resolutions are valid as soon as they are adopted by a committee; minutes need no confirmation by, nor are they submitted to, the Council. The only exceptions are the raising of capital and the appointment of a chief engineer. These are submitted to the Council in special reports and on no occasion in the author's long experience has the least difficulty been encountered.

Showrooms are very diverse in size, type, equipment and staffing, most likely due to local conditions, which should be the ruling factor. Experience will show what type—if there prove to be one—is generally the most fruitful in results. Meanwhile, there are still some committeemen who have a wrong conception of their purpose. They cling to the error that a showroom is a separate trading entity, which is to be tested as such by the profit it yields directly. A showroom is purely ancillary to the main undertaking, and is to be judged by its influence on the general demand for electricity, and by its success in teaching the public to apply electricity to new uses. If it is effective in those respects any losses it may show, within reason, are of little or no account. They should be viewed as (what in fact they are) the cost of this special and unrivalled form of advertising. The crucial thing is the situation.

To place a showroom, however well equipped and imposing, in a wrong situation, is to invite failure. To open one for instance on a main route along which people generally move to and from definite points when they are usually set upon definite purposes of their own is generally a mistake. The establishment, large or small, should be placed where the public habitually linger during their spare moments, and, if possible, where the fair sex, to whom we look for domestic load, have got into the habit of shop-window gazing as a way of beguiling the time. In other words, we should try to catch people's attention when they are not pre-occupied. Even a small central showroom so placed as to do this is worth more than a palatial establishment elsewhere. A pretentious showroom in any case is apt to give to the poor or middle-class consumers the false idea that electricity, except for lighting, is a luxury beyond their means.

Discussion

The discussion was opened by ALDERMAN J. CHUTER EDE, M.P., chairman of the British Electrical Development Association, who criticised the absence of any reference to the duties of the clerk to the council. Like the engineer, he had to deal with technicalities which the chairman had to present in ordinary language that would be likely to convince lay members. Nothing was more likely to discredit democracy than the practice in some towns of changing electricity chairmen every year as one of their duties was to plan ahead over several years. Plenary powers should not be required for committees if the latter had earned the full confidence of the council. The man of common sense who would substitute a sense of responsibility was the proper person to have control: the trained bureaucrat would not have a long run. A great achievement of this country was to make the control of the expert by the layman a working possibility.

ALD. J. W. LONGLEY (Bradford) believed that with the growing recognition of the importance of electricity committees the more capable men would be selected for them. Engineers should feed new committeemen with information regarding other undertakings as well as their own, and with E.D.A. literature. One difficulty was that membership of more than one committee often prevented full attendance of the committeemen at any one of them. Chairmen should keep in close touch with deputy-chairmen and with the staff and workmen in order to show confidence in them. It was a great mistake for the chairman and his deputy to be changed at the whim of the council. In Bradford there had been only three chairmen in thirty years. Instead of extending executive powers, councils were tending to reduce them.

ALD. J. H. COATES (Mayor of Watford) said the danger arose not from the lethargy of committeemen so much as from those who tried to run the undertaking and to over-persuade the engineer. Any form of opportunism militation against low tariffs, such as the hiring of cookers below cost price, was to be deprecated. He considered that the portion of Ald. Huntsman's paper regarding the McGowan Report the soundest part.

MR. H. C. LAMB (Manchester chief engineer) disclosed that when two or three borough electrical engineers got together one of the first questions asked was "What sort of a chairman have you got?" Generally the answer was to the credit of a chairman, but sometimes the complaint was that he had not had much experience and was inclined to give way too readily. Often large expenditures were passed at once, whereas much time was wasted in debating trifling points. The committee should give fullest discretion to the engineer in staff matters. He suggested that a valuable paper from Ald. Huntsman would be on the engineer as he had known him.

ALD. A. STURGESS (Derby) was unable to agree that the responsibility of the non-carrying out of the Walker scale of salaries for chief engineers should be placed upon the committeemen. Prior consent of the committee concerned should be obtained to such claims, which should be confirmed by an authoritative body. Representations should come from the engineers themselves or from the I.M.E.A. Council as soon as possible in order that negotiations might be opened with a

view to obtaining a definite settlement of this question. He could not agree that statutory plenary powers should be given to electricity committees.

ALD. E. S. REYNOLDS (Bridport) objected to the attitude of the author to the McGowan Report. As one who was concerned with a small and successful undertaking, he said that they had pledged the ratepayers' money and they should put up a very strong fight against the proposals. In a small undertaking closer contact could be maintained with the consumer.

COUNCILLOR H. B. VORLEY (Islington), who has been a member of one committee for thirty-four years, thought that constant change in this respect was a very bad feature of municipal administration. To deal with new members a strong chairman of long standing was necessary. He had not found that Imperial politics caused disagreement on essential points in local affairs. "Make friends with the chairman of the Finance Committee," he suggested. Many capable engineers were scandalously underpaid. He thought that the time was coming when it would be necessary to distribute over wider areas, but beyond that he considered it was not the time or place to discuss the McGowan Report or the "white paper."

COUNCILLOR W. HEBDEN (Shoreditch) caused some comments by suggesting that women were not keen on serving on electricity committees. In twelve years' experience, he said, he had not found any scheme of an engineer rejected, although he had known many cases in which ideas of laymen had been turned down with a wealth of technical phraseology. This made for expedition in getting things done. Men with technical knowledge on the committee he had found to be an obstacle. He knew of no instance in which the full council had rejected any proposals of his own committee. For twelve years the chairman and his deputy had worked together and had interchanged with entire success. He deprecated the introduction of the McGowan Report into the discussion, but said he believed that the present system would be better than that of large areas for the interests of the engineers and their staffs.

Councillor R. Appleton (Malvern), who spoke as a chairman of both a gas and an electricity committee, had not found any jealousy between the two bodies. He was not in favour of committee men keeping in touch with individual members of the staff. That should be regarded as the sphere of the engineer only.

COUNCILLOR H. AIREY (Kendal) referred to the fable of the wolf and the lamb, and suggested that the I.M.E.A. watchdog had herded the sheep into a corner, leaving the lambs unprotected.

The vote of thanks to the speaker was proposed by Ald. Sir PERCIVAL BOWER (Birmingham), who mentioned his association with Ald. Huntsman on the National Joint Board and National Joint Industrial Council, on which the latter had rendered most valuable services to the industry. He had been surprised at the trend of the discussion. Ald. Huntsman had, he believed, been trailing his coat a little and some of them had fallen over it. No doubt Ald. Huntsman had revelled in the criticism, and this would probably appear in his written reply to the discussion. It was certainly not true to suggest that the larger undertakings were unmindful of the needs of the smaller concerns, and he hoped to express his own views on Friday as the present meeting was not the place at which to discuss these matters.

Alderman Huntsman reading his paper on Wednesday morning

Developing Rural Areas

Paper presented by Messrs. V. A. Pask and R. W. Steel at the Wednesday afternoon session

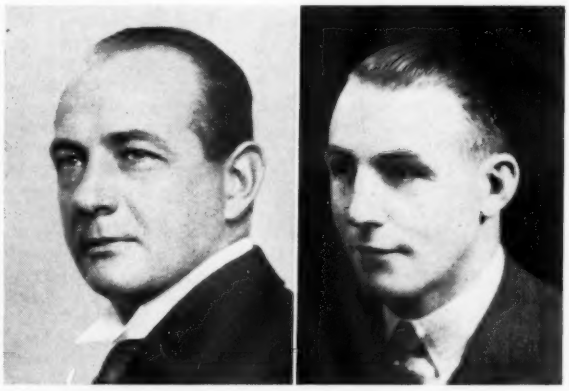
THIS is a short general paper, including a longer description of the work which has been carried out in the Norwich Corporation's rural area, together with 37 statistical appendices.

The authors point out that a short-term policy in planning the lay-out of a system may necessitate radical and costly alterations within a few years and is always expensive in the long run. They state that on the whole the farming load in the area has so far proved to be rather disappointing.

The greatest scope appears to be in securing domestic load, which on many farms is very often considerably greater than the strictly farming demand. Also electric pumping is being increasingly used for water supply, sewage disposal and drainage purposes, while rural industrial loads are many and varied. Country consumers demand the same high standard as is customary in urban areas.

From the supply authority's point of view a steady rate of progress over a longer period is much to be preferred to a large volume of work in a short period of two or three years. Constructional work can be carried out more cheaply by direct labour than by contract, as technical supervision is not duplicated in the former case. In spite of cable advantages, an overhead system of transmission and distribution is, in general, the only one that can be justified on economic grounds.

The capital expenditure ranges from £700 to £1,000 per sq. mile of rural area served. Remunerative working involves an annual revenue of between 13 and 20 per cent. on the total capital expenditure, and between 23 and 35 per cent. on the capital expenditure necessary to provide sub-stations, low-voltage distributing networks and services.



[*Elliott & Fry*

Mr. V. A. Pask (left) is city electrical engineer of Norwich and Mr. R. W. Steel (right) is one of his assistants

The Norwich Rural Area

The Norwich Corporation's rural area of 670 sq. miles extends for a radius of 15 miles round the city. It consists mainly of arable land and includes most of the Broads, extensive parklands and much marshland with a 12-mile sandy coast line.

The population is below the average for England and Wales, being 93,286 in 1931, or 139 per sq. mile; 91 per cent. of the dwellings have a rateable value of less than £15 per annum. The area is mainly agricultural, the few industrial activities being allied to agriculture. It includes the Electricity Commissioners' rural demonstration area of 125 sq. miles, with a purely agricultural population of 113 per sq. mile.

There are 544 miles of high-voltage and 405 miles of low-voltage lines; 204 villages are supplied; there are 573 sub-stations and 14,831 consumers; the energy sold in 1935-6 was 8.8 million kWh and the net revenue £69,863. In 1936-7 the maximum demand was 4,030 kW.

The high rate of growth is only just beginning to show signs of falling off. Already over 53 per cent. of the occupied dwellings in the area have been connected, and 72 per cent. are on the route of existing mains; in many cases two or more sub-stations are required for each village. The annual increase of units sold continues to grow year by year. The average number of units sold per consumer during 1935-6 reached 594, and there is still no sign of the curve bending over. The revenue is also increasing rapidly, and is closely following the curve given by the units sold figures.

The connected load is 33,375 kW and practically all classes of load are being connected at an increasing rate, with the exception of the horse-power of motors installed (3,639) in which case the annual increment has remained constant for the past four years. The number of cookers in use in March, 1937, was 4,032, being one cooker for each 3.7 consumers.

For administration the area is divided into three parts of 230 sq. miles, each with a district office, showroom, mains depôt, etc. Such decentralisation has proved to be highly satisfactory.

The authors describe their distribution system, types of lines, switchgear and transformers employed. Load curves are included. The large number of cookers in use has undoubtedly made an important contribution to the improvement of the annual load factor.

The p.f. of the rural load is very good, as the bulk of the apparatus connected for domestic use, the industrial load only forming 13 per cent. of the total. The charging current taken by the cables on the system is considerably greater than the magnetising current required by the transformers resulting in an almost constant leading power factor. At periods of maximum load the p.f. is rarely below 0.975 lagging, while during periods of light load during the night it is 0.9 leading. There is very little trouble with pressure drop on the system under normal conditions as provision has been made for much heavier loads.

Operation Experiences

When supplies of electricity were first given to the rural area, it was thought that when occasional interruption of supply for an hour or two occurred, no serious objection would be raised. Such interruption of supply did occur, and it was soon found that owing to the large number of cookers, together with incubators, milking machines, wireless sets, electric clocks, and other apparatus connected, continuity of supply was as important in the rural area as it was in the city.

An analysis of the faults which have occurred during the last two years shows that a large proportion was due to lightning. The area around Norwich suffers severely from summer lightning storms. The problem was tackled in several different ways, the first method being to install a number of auto-valve lightning arrestors. Unfortunately, results cannot be given with any degree of accuracy, as they are negative in character. A second method of approach was to attempt to reduce the severity of the surges induced in the lines by shielding them with an overhead earth conductor but the cost of this is considerable, *i.e.*, £70 per mile, or 20 per cent. on the capital cost in one case. A third method has been the installation of arc suppression coils and the results have been very encouraging.

The paper includes many statistics of costs, types of load connected, energy used, and financial results. Consumers increased by 4.5 per cent., energy consumed by 30.2 per cent. and the revenue by 18.2 per cent. in the last twelve months. During 1936 the average consumption was 433 kWh per consumer and the average revenue was £4 15s. 8d. The increases in domestic load and revenue were 17.6 and 15.1 per cent. and in the farming load 22.3 and 18.1 per cent. respectively, which was considered substantial and encouraging.

It is necessary for a vigorous sales policy to be continuously carried out, particularly as the area is relatively poor. Facilities for the wiring of premises on deferred payment or simple hire terms are provided, and nearly 70 per cent. of the total installations connected have been furnished in this way. The capital expenditure on wiring in the rural area to date is over £40,000. Installations of a value up to £30 are provided, and payment is spread over three, five or ten years, to suit the particular consumer. If the cost of the installation exceeds £30, the excess amount over this figure has to be paid for as a cash transaction. Should the consumer leave the premises, no further payment is required, and no difficulty has been experienced in getting the incoming consumer to take over the installation when a change of tenancy has occurred.

For small residences of a rateable value of £10 or less, and where no extension of main is necessary, a rental wiring scheme is available. Not more than four points, including a plug suitable for a kettle, iron or small fire, are installed for a rental of 2s. per point per annum, collected through a two-part tariff prepayment meter. Most types of apparatus, including motors, may be hire-purchased, payments being completed in a three-year period. Cookers, water heaters, fires, motors and other apparatus to the value of over £40,000 have been provided on simple hire terms.

Special Night Rate

A special rate of ½d. per kWh is available for domestic consumers, and business premises between the hours of 10 p.m. and 8 a.m., which is intended especially for night water heating. The average consumer makes full use of the supply when a guaranteed minimum annual revenue is required, and towards the end of the guarantee period increasing consumption is usually recorded. The average revenue in the first year from consumers under these guarantees is 98 per cent., rising to 109 and 115 per cent. in the second and third years. The anticipated expansion in consumption is being realised.

In the rural area 3,000, or 75 per cent., of the total prepayment consumers were using less than 100 kWh per annum. These consumers were practically all taking advantage of the rental wiring scheme and were thereby enabled to install up to eight points without being required to pay a minimum charge or rental. As the average consumption of quarterly consumers was 849 kWh per annum, it was decided to substitute a two-part tariff, giving the same terms to prepayment consumers as are offered to quarterly consumers; the minimum r.v. charge is 7s. 6d. per quarter with energy at 1d. per kWh, the rental wiring charge of 2s. per point per annum being collected with the fixed charge through the two-part tariff prepayment meters which are available for this class of consumer. A preliminary survey of a number of consumers who were changed over, shows that during a period of twelve months their consumption has increased by 60 per cent.

There has been a considerable amount of misconception as to the revenue return required. It has generally been believed that if a 20 per cent. return was obtained on the capital expenditure in providing sub-stations and low-voltage distribution all was well, but this is not true. The percentage return required is an increasing figure, because the loan charges are not the only ones which enter into the cost of supplying electricity. Other charges, such as the cost of energy, repairs and maintenance, rents, rates, taxes, wayleaves, management, &c., play an important part in making up the total cost, and they continue to increase as the sales of energy and number of consumers grow, even after capital expenditure on the distribution system has ceased.

The authors' conclusions are that the provision of an abundant supply of electricity at a reasonable price in rural areas is essential for the well-being of the nation as a whole. Rural districts with population densities well below the average for England and Wales are at the present time capable of being developed intensively on an economic basis after the lapse of a few years, and the scope for such development is rapidly increasing, due to the rising standard of rural communities, the expansion of industry in rural areas and the increasing use of electricity in farming.

The liberal use of overhead lines is essential in rural areas to ensure minimum costs of transmission and distribution. The lay-out for the whole area should be carefully planned so as to ensure the fullest possible economy in capital expenditure, consistent with the furnishing of adequate supplies and reasonable continuity of service.

Tariffs and Facilities

The tariffs offered to rural consumers must be competitive with other forms of light, heat and power, and should be such as to encourage the fullest possible use from the time when supplies are first made available. Facilities should be provided for the furnishing of installations on hire-purchase or rental terms, and for hire-purchase and simple hire of apparatus on reasonable terms. A continuous and vigorous sales policy is essential. Showrooms should be provided in the larger townships, and for the smaller villages a travelling showroom and demonstration van is desirable.

Financial loss must inevitably be incurred during the construction and development stages when a comprehensive scheme of rural electrification is undertaken over a short period. For this reason it is desirable that the rural area

should be attached to a large urban undertaking in a position to furnish a bulk supply to the rural areas at a comparatively low price, be able to carry the financial burden during the early years without putting an undue weight on its own consumers, and to offer the advantage of the existing administrative, technical and sales organisations.

Discussion

Mr. V. A. PASK read a long abstract of his paper, jointly written with Mr. R. W. Steel, both of Norwich, occupying forty-five minutes.

Thirteen engineers, each limited to five minutes, intimated their intention to take part in the subsequent discussion. The first was Mr. R. W. L. PHILLIPS (Bedford), who said nearly all the experience obtained at Norwich showed results similar to those obtained at Bedford. No material differences had been revealed. The general state of farming in this country showed that very little electricity was used actually in farming operations. Farms were very small relatively, and costly to connect up. If there were some co-operation to reduce the number of small farms there would be more reasonable prospects in larger districts. Farmers had much information that might be useful if it could be obtained. He did not expect to obtain much load from purely farming operations. Big combinations seemed the solution, both from the points of view of farmers and electricity suppliers. He also found that rural continuity of supply was demanded equally as in towns. He entirely agreed with the authors' remarks on lighting troubles. Demonstration areas were experiments that were as yet inconclusive, but they had very nearly been made to pay. The cost of servicing cookers was very expensive over wide country areas.

Mr. A. NICHOLS MOORE (Newport) referred to increasing interruptions of supply since networks were connected to the grid system. His view was that there was a wrong attitude about rural development. They should not look for immediate returns, but consider it as normal extension of a system as a whole and part of the general expansion, without being too concerned about any particular percentage return on capital. What they might lose on the swings they would gain on the roundabouts.

MR. J. S. PICKLES (Dumfries) said his remarks were by way of criticism. There should be no cables in rural areas, and he was surprised at the number used by the authors. Less use of cable would save money; the authors' wayleaves were also high (7s. 6d. per pole). So many people when talking of farms did not include cottages, &c. They should talk of farm tapping points from the revenue point of view, rather than the farm itself. The authors had not included the Government grant in their statistics of costs.

MR. W. A. WALKER (Kettering) said that with regard to farming load, the farm domestic load was much the most important component, and water heating could be much further developed. Tariffs should be as few as possible, with facilities for hiring wiring and apparatus. It was difficult to differentiate between various kinds of farm in framing two-part

Messrs. A. J. Hutchinson and L. L. Robinson and Ald. J. W. Schofield on their way to the Dome, Brighton

tariffs. Churches and chapels did not justify ½d. per kWh, as they frequently needed extra service connections. Generally, rural networks were not suitable for supplying country industrial loads of any size. He had found that lightning surges were the major cause of interruptions of supply. Some better way of dealing with that problem was needed. He did not now demand any guarantees at all from consumers in his area; all such agreements, initially entered into, had, as the result of experience, been modified.

MR. H. WILSON (Ashford) pointed out that the first thing to decide was one of principle, namely, whether the area was to be self-supporting or not. That would affect tariffs and method. Why should a country resident who had no town's amenities at all expect to get electricity at the same rate as in towns? Urban districts or boroughs usually took all the responsibility for losses, and that was the reason why rural areas should stand on their own. He also had been disappointed in the return obtainable from farm load.

MR. C. W. SALT (Carlisle) said that with regard to the use of cables or overhead lines, there was something to be said

Councillor F. Challis King chatting to Mr. T. E. Ritchie

on both sides. The difference in costs could be very much reduced where conditions made the employment of cables appropriate. The underground system should be carefully considered and not rejected merely on first cost. There would be an enormous future for cable factories if prices could be kept low enough to encourage the use of cables in rural districts. Those responsible for fixing cable prices had not offered this kind of encouragement.

MR. W. E. JONES (Basingstoke) said that country people were conservative, and a 25 per cent. return was necessary to make a truly rural (wooded) area worth while. He fully agreed that capital charges were not the only factor that retarded development; for example, local rates, etc., had a very considerable influence, too.

MR. P. WARDLE (Cannock) referred to pole-mounted gear, and said he was now all in favour of putting as much as possible at ground level and protecting it in adequate ways. No reference had been made to competition from oil, gas, &c., experienced in the Norwich area; after seven years he (the speaker) would have expected a larger number of consumers to have been connected. There was no necessity for low-voltage power tariffs for consumers of the order of 100 kW. who could be connected to the high-voltage system.

MR. E. A. LOGAN (Erith) contended that rural distribution needed an entirely distinct and separate technique, and must be operated on a decentralised basis. His area had shown a return of 3 and 5 per cent. after three and five years. They had undertaken development of that sort as a money-making proposition, not from motives of philanthropy, and the results had proved to be worth while.

At this stage the President terminated the discussion requesting the remaining five prospective speakers to submit written contributions, and asked the authors to reply briefly.

In doing so Mr. PASK pointed out that most of the younger farmers were more enterprising; in fact, there was a distinct cleavage between younger and older farmers, the latter not even wishing to have electric lighting. The cost of cooker repairs in his area was of the order of 8s. per annum. There was no law that could be laid down with regard to the return needed on low-voltage rural distribution; it was a matter that needed looking into, and the Electricity Commissioners had power to reduce the figure of 20 per cent. if warranted. With regard to the Government grant in respect of his area, the figures in the paper were an attempt to show the position without any such grants. Urban areas (when large) could very well subsidise country districts (when small), but a halt must be called somewhere, and that procedure could not properly be applied when the rural area was very large. The general consensus of opinion was that overhead lines were essential if rural development was to be economic. The 2s. wiring rental mentioned was perpetual, and the undertaking carried out all repairs without cost to the consumer.

Mr. W. J. BACHE (Cheltenham) proposed a vote of thanks, remarking that whereas the authors were dealing with a particular area, most speakers in the discussion had attempted to apply their arguments to conditions in general.

Domestic Refrigeration

Paper presented by Messrs. W. F. T. Pinkney and A. J. Ryan at the Thursday morning session

THIS paper urges the electrical industry to capture the rapidly growing domestic refrigerator market before it is lost to competitors, and attempts to show that electricity supply authorities will find that the business is very well worth while securing.

The authors consider that the internal capacity of a domestic refrigerator should not be less than 3 cu. ft., consuming 300 kWh per annum, and that 4 or 5 cu. ft. (500 kWh yearly) is necessary for most families. Although refrigerators do not use much electricity, the energy utilised affords a greater margin of profit because most of it is consumed during the summer months and at night. They operate intermittently, so their diversity factor is great; in the United States it has been put as high as 83 per cent.

It seems unlikely that the load obtainable from a relatively high refrigerator "saturation" would entail any need for additional mains or distributor capacity. The authors suggest that the industry should aim at 100,000 refrigerator sales in the next twelve months, which would add not less than 30,000,000 kWh per annum to present consumption, with a negligible increase in maximum demand. (The additional energy consumption from the domestic refrigerators sold in this country in 1936 must lie between 13 and 14 million kWh per annum.) In five years they should be able to ensure that 1,000,000 consumers were using refrigerators, and the resultant increased output of at least 300,000,000 kWh per annum would be valuable.

The profit on the sale of refrigerators is appreciable, and the cost of selling is not as high in relation to the value as is the case with other electrical appliances. The showroom space taken up by a refrigerator of £30 to £40 list value is usually less than that of other appliances of equivalent value, and this is of importance in showrooms situated in main streets where rental and rateable value is high.

Refrigeration is of advantage to the supply authority, inasmuch as it is a further instance of the versatility of electrical service, and probably gives more satisfaction to the consumer than any other domestic application of electricity.

[*Philipson*

Mr. Pinkney (left) is with the North-Eastern Electric Supply Co., and Mr. A. J. Ryan is the Hastings borough electrical engineer

About 18 months ago it was estimated that the potential market for domestic refrigerators in this country was 700,000. Since then one million newly wired homes have been connected, prices have fallen and incomes have increased. Families with an annual income of £350 or more are potential users.

A particularly good opportunity of selling refrigerators is provided this year by the E.D.A. campaign (June to September) which is supported financially equally by manufacturers and the Association. In the authors' opinion direct mailing is the most effective medium for this class of business, coupled with personal interviews and specially trained salesmen. Such training need not be long or expensive, and courses might be arranged at leading manufacturers' works.

Window displays in the showrooms in hot weather are essential, and if they are supported by demonstrations of cold cookery they result in considerable sales.

Speaking generally, the manufacturers will sell to the electricity supply undertakings at terms which vary according to the amount of after-sales service which the various undertakings require from the manufacturers. Where the supply authority does not provide any showroom display, nor undertake the servicing of major breakdowns, the manufacturer who has to provide both the display and such servicing offers a relatively small discount. A greater discount, however, is offered where the undertakings have display facilities and undertake the servicing of major breakdowns.

Still greater discounts are offered where ample display facilities are available, and the undertakings carry out all repairs and maintenance work—that is, where no costs fall upon the manufacturers except the replacement of parts which may have failed under guarantee. Other adjustments may be made in the terms by negotiation for such matters as the employment of salesmen by manufacturers on behalf of an undertaking.

The five years' guarantee that is offered by the majority of manufacturers is of considerable advantage to those electricity undertakings which are prepared to extend their hire-purchase period, and the majority of the public seem to prefer to purchase over an extended period.

The pace has been set by the gas undertakings around London, which, in 1936, sold a large number of refrigerators on the basis of 2s. 6d. per week, and in some cases even lower terms are now offered. Such gas-operated refrigerators are, however, generally of smaller capacity than the smallest electric refrigerator recommended.

After negotiation with the electrical refrigerator manufacturers last year it was found possible to sell electrical refrigerators at the same low figure, many undertakings having offered hire-purchase over a period of five years. Some undertakings consider that a three-year period is long enough, but results seem to show that 2s. 6d. per week is a popular figure which increases the amount of business done.

Running Costs

There are two types of machine, namely, the compression (rotary motor) and absorption (stationary heater). The former is cheaper to run, the latter, being fundamentally less efficient, has a smaller reserve capacity for overloads and the temperature is not maintained so uniformly.

The annual cost of operating the 4 cu. ft. size, with electricity at 1d. per kWh, is £1 9s. 2d. for the compressor and £2 3s. 5d. for the absorption types, or £2 18s. 9d. with gas at 8s. 6d. per therm. Tests of machines (while in use on consumers' premises) of 3.1, 4, 6 and 7 cu. ft. capacity, using driving motors of 1/14, 1/8 and 1/6 h.p. revealed average running times per day of from 45 minutes to 7 hours 24 minutes. The average consumption per day ranged from 0.117 to 0.858 kWh.

The authors estimate the cost of food wastage (largely unnoticed) at 2s. 6d. weekly per household. The smaller the household budget the greater the need for effecting economies in housekeeping expenses by the use of electrical refrigerators, which remove anxiety about food. The added ability to vary the daily diet without waste enables food to be purchased in relatively larger quantities, a matter of great importance to the modern small household and in rural areas where food cannot be purchased from day to day.

TABLE I.—RELATIVE REVENUE EARNING VALUES OF ELECTRICAL APPLIANCES.

Appliance.	Capacity in kW.	Annual consumption of energy.	Units used per kW of demand.	Annual revenue for appliance @ 1d. per kWh.	Annual revenue per kW demand.	
					Excluding diversity.	Including* diversity.
				£ s. d.	£ s. d.	£ s. d.
Iron	.500	50	100	4 2	8 4	12 10 0
Kettle ...	.950	200	210	16 8	17 6	8 6 8
Vacuum cleaner ...	.200	27	135	2 3	11 3	22 10 0
Washing machine ...	.500	20	40	1 8	3 4	41 13 4
Washboiler	3.200	130	41	10 10	3 5	10 8 4
Water heater (12 gall.) ...	1.200	2,000	1,666	8 6 8	6 18 10	41 13 4
Water heater (1½ gall.) ...	.750	750	1,000	3 2 6	4 3 4	41 13 4
Cooker ...	5.000	1,500	300	6 5 0	1 5 0	16 14 3
Refrigerator ...	.165	350	2,121	1 9 2	8 16 9	29 3 4

* This column shows the estimated revenue in relation to each kW of collective demand which this class of appliance makes upon the generation, transmission and distribution systems.

The paper includes a table (Table I) showing the relative revenue-earning values of various electrical appliances to show how well the refrigerator stands in this respect.

A basis of 1d. per kWh has been taken for convenience, but it is recognised that most undertakings supply at rates of ½d., ¼d., or even less per kWh, but the ratios will remain the same.

The discussion on this paper will be reported in our next issue.

E

Domestic Equipment Developments

Notes upon the I.M.E.A. exhibition

HAS automatic oven control on domestic electric cookers come to stay? Many manufacturers are still looking upon it with not too kindly an eye as being unnecessary and just another gadget to go wrong and to increase the cost of production. Nevertheless, a glance round the I.M.E.A. Exhibition clearly indicates that there must be a strong and growing demand for this feature since every cooker maker there without exception will—albeit reluctantly—supply models so equipped if desired. Furthermore, where automatic control is not already fitted provision is now generally being made in all standard models for its possible subsequent incorporation with the minimum trouble on the consumers' premises. For rapid conversion of non-automatic cookers Simplex can probably claim the record time (10 minutes) but this figure is closely challenged by a number of others.

Left: A 12-gal. rectangular "Densacone" cistern in section and, right, circulator with plates removable for descaling and a new water-heater element (Drake & Gorham Wholesale, Ltd.)

One of the strongest arguments against automatic control in the past has been the serious difficulty of obtaining adequate regulation of temperature. It is not fair to blame the thermostat for this, though we are by no means convinced that finality in design has been reached. In the first place modification of the oven itself, particularly with regard to the position of the elements and to air circulation, is often necessary to ensure uniform temperature throughout and this has not always been done.

Designers are now, however, getting down to business. Belling and Ediswan have both made definite improvements to their air circulation systems and English Electric seem to have found a solution of their troubles by using small, light side elements with a specially designed guard to ensure convected heat. On this account Mr. J. J. McKenna claims for the "Ritemp" system the closest regulation so far achieved, namely ± 5 deg. F. over the whole heat range.

Are thermometers used in conjunction with thermostats unreliable and misleading? On account of their different positions in the oven Mr. D. R. Moffat (Moffats, Ltd.) thinks that they are and prefers instead to incorporate in his company's new hydraulic type thermostat a neat indicating device which shows when the desired temperature has been reached. This thermostat, incidentally, is compensated for room temperature and is designed particularly with a view to trouble-free service rather than extreme accuracy, which Mr. Moffat considers is unnecessary and only likely to result in maintenance difficulties. Before leaving thermostats it is of interest to note that the latest G.E.C. model is now fitted with an on/off switch.

Though Moffats still keep to top and bottom heat (claiming better browning), side and bottom heat are generally the order of the day, except in the case of the smaller-sized cookers in which a top element serves also as a grill. Sometimes side heat is relied upon entirely and in one novel Carron design the bottom elements with their baffle plate may be removed and the additional space obtained used for cooking.

This is only one instance of manufacturers' efforts to get the most out of, or rather should we say get the most *into*, their cookers. Plug-in elements have proved a godsend in space-saving, while the use in Falk, Stadelmann "Servis" models of the elements themselves as the shelf runners not only economises space but facilitates cleaning.

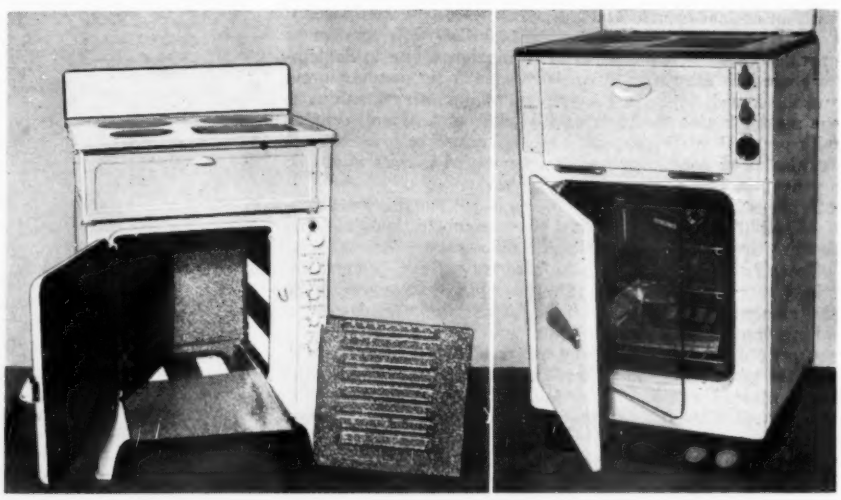
The "Phantom" oak convector (Greene Phillips)

Talking of cleaning, we find the removable oven interior still very popular both with the public and with the maintenance engineers. It is a feature of a large proportion of the cookers made to-day and an interesting variation is a three-piece interior on the new Simplex models.

While coloured cookers admittedly militate against changing kitchen decoration schemes, there is a definite demand for them from certain quarters and we do not agree with a suggestion overheard that they are largely made for exhibition displays. At any rate, most makers have thought it worth their while to increase their ranges of coloured models and the Tricity "777" cooker is now available in colour for the first time.

"Streamlining" has not yet run riot among cookers to the same extent as in certain other appliances, so that the introduction of four new Belling models, two vertical and two horizontal, raises the question of the probable exterior appearance of the cooker of the future. These new Belling products when closed look almost exactly like refrigerators. It seems probable that the housewife will before long insist that her cooker and refrigerator—and possibly other equipment as well—shall match. Such kitchen planning services as Hotpoint offer are a move in this direction.

So closely has the refrigerator design of the Belling cookers been followed that, in addition to a handle, pedals are provided for opening the oven door, or rather doors, an inner armour-plate glass door permitting the inspection of food cooking inside without losing heat. The hinged back splash plate completely covers the hob when not in use.



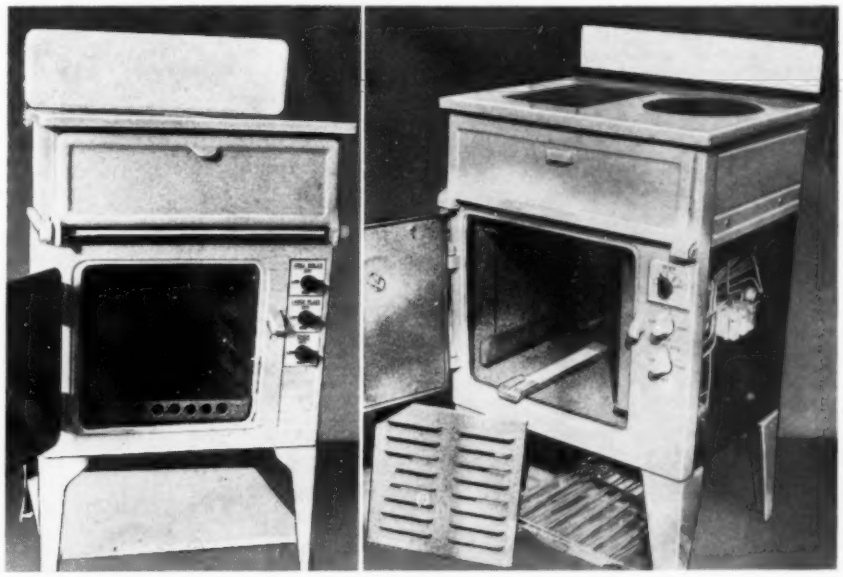
Left: Simplex "Creda" de luxe (A397) fitted with "Credastat" control. Right: One of Belling's new cookers

The phenomenal success of the small table top cooker for use in restricted spaces has led to further interesting developments, possibly the most outstanding of which is the new B.N.E. "S.B.1" model, in which the space underneath can either be used as a hot-cupboard or fitted with a 1-kW reflector-type fire. This combination of cooker and fire should make a big appeal to electricity supply undertakings for hire purposes in municipal housing schemes particularly, since the number of plug points required is reduced and also the possible maximum load is restricted, since only the cooker or the fire can be in circuit at one time.

While the "Baby Belling" cooker continues as popular as ever two larger similar models have been introduced to meet the requirements of those who want something a little bigger yet wish to economise space. All three of this new "Baby" series have plate warmers. In the Siemens "Minor" a number of small alterations have been made, including the location of the elements at the bottom instead of the side, so giving still more useful cooking space. The standardisation of elements as far as possible in all Siemens models considerably facilitates maintenance.

Nothing spectacular has occurred recently in the way of boiling plate design and the preference for "visual heat" or solid type in any particular area appears to depend to a large extent on the personal likes or dislikes of the engineer in charge of the local supply undertaking—or of his wife. Four-heat plates giving simmering are meeting with a certain degree of favour. Possibility of flaking or rusting of the solid-type plate is now claimed to have been eliminated by the Jackson Electric Stove Co., Ltd., by spraying it with aluminium, and Mr. V. H. Vale, of the G.E.C., tells us that failures of his company's totally enclosed plates have been reduced by 60 per cent. since the double rim was introduced some months ago.

The holding of the Convention at this time of the year precludes the presentation of many of next season's fires. However, we saw enough to gather that the reflector types are likely to make still further headway and that there will be many small modifications of design, together with a further general improvement in finish and the introduction of new colours. Carron are likely to meet a demand for a really attractive portable prepayment meter fire with their new lightweight 2-kW reflector model finished in "Neutra Carrontine."



Left: "Carronette 2" cooker. Right: English Electric "212" with automatic temperature control

A welcome development is the introduction by Berry's Electric into its "Haloberry" series of a fire which, apart from giving a visual effect of warmth or coolness, goes a step farther than hitherto and incorporates a complete air-conditioning plant, in place of merely an air circulating fan. The combination of a fan with a heater is now quite commonplace, but the four-tiered design of the H.M.V. model is unusual.

Convectors are making slow but steady progress, and both Greene, Phillips & Co. and Elexcel, Ltd., are introducing new models, all with "psychological" lighting effects. The former company's new apparatus differs from previous products only in improved appearance, the truly low-temperature heat elements giving a discharge-air temperature of 120 deg. F. being unaltered. The Elexcel models, available in 1-, 2- and 3-kW sizes, can be had for fitting into existing fireplaces.

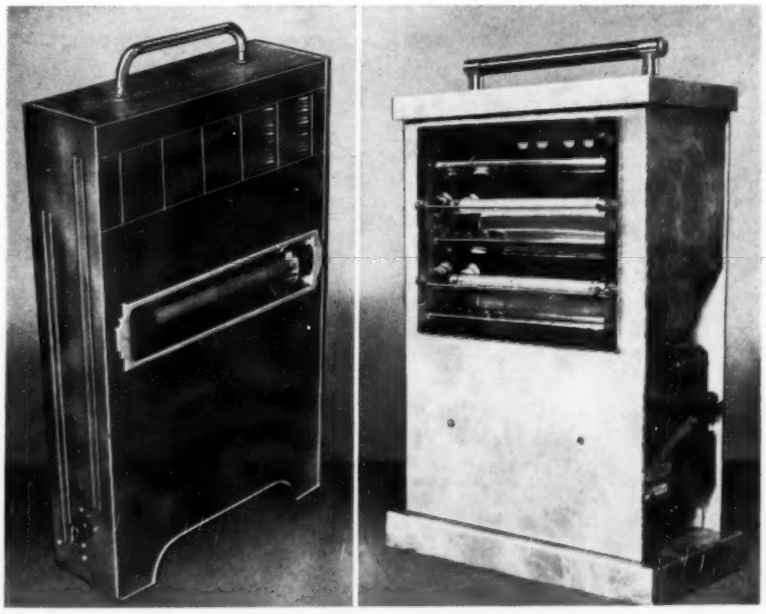
Anti-scale precautions, easy fixing, and the reduction of heat losses, are the principal problems to which water-heating equipment manufacturers have directed their attention recently. For hard water districts Ferranti now use in their immersion heaters and circulators special elements of low watts density, and all their non-pressure heaters are now fitted with non-return fittings. In the Drake & Gorham circulator the three elements are now encased by three strips which can be taken off to remove scaling. A new type of element employed in the "Dragor" water heaters, immersion heaters and circulators has flexible refractories to prevent sagging.

The J. & P. Tubular Heater Co., Ltd., still claims to be the only manufacturer of a truly flexible element, but both Metrovick and Bray have new elements which can be supplied in almost any shape, thus permitting a greater loading in less space.

No wiped or soldered joints are necessary for the new Aidas clip-on flanges for the installation of immersion heaters or for the "Simplifix" water heater fittings which employ "Yorcwyte" flexible meter piping. Elexcel, Ltd., has another ingenious system for easy fixing.

In the new "Highlow" combined cistern-type water heater, heat losses have been considerably reduced by taking the cold water supply pipe to the bottom of the inner container by means of a pipe fitted in the lagging between the inner container and the outer casing. Another current-saving device is incorporated in the new Heatrae double-wound auto-circulator whereby the position of the heat zone can be adjusted.

Improved appearance of water-heating equipment is general. No screws at all are visible in the non-ferrous casings of the latest Santon thermal storage equipment, while attractive lines are combined with accessibility of all parts in the new Johnson & Phillips apparatus.



Left: An "Elexcel" convector and, right, Carron prepayment meter fire

The I.M.E.A. Exhibition

A stand-by-stand review

The limited space available at the Corn Exchange, Brighton, has prevented manufacturers from displaying all the products they would have wished. Nevertheless, the eighty stands give an excellent opportunity for inspecting the latest electrical developments, especially those appertaining to domestic and street-lighting apparatus. Home laundry and water heating equipment is particularly well represented this year, while many specially designed reflectors make their appearance for use with the new low-wattage electric discharge lamps

Actadis, Ltd.

This exhibit is designed to illustrate the principle and application of the Actadis system of carrier-current control whereby the switching of public lighting, off-peak heating, etc., can be effected directly from the generating station by the use of musical frequency signals injected on to the high-voltage system. These signals pass through the substations and operate any number of relays at all points of the network. The system is widely used on the Continent, and many cities, including Paris, have been completely equipped.

Photographs and diagrams illustrate the signal transmitting equipment as applied to high-voltage systems up to 33 kV, and also to low-voltage systems. Individual parts of the transmitting equipment, such as condensers and transformers, and a number of reception relays for street lighting control, etc., are shown, the latter in operation from a portable high-frequency generator. Various other relays suitable for off-peak water heating and space heating are also on view, and a demonstration is given of superimposed high-frequency current by means of a cathode-ray oscillograph.

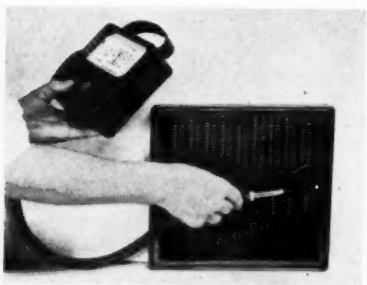
Aidas Electric, Ltd.

Two 1½-gall. water heaters, mounted above a basin and sink respectively, are connected up so as to indicate the easy method of fitting. Parts of the heaters are also shown, and demonstrations given of technical points in their construction. The method of installing the water heaters, using "Simplifix" fittings can be adopted by an electrician without the need for a plumber's assistance.

By using a new clip-on flange it is possible to fit an immersion heater to a domestic hot-water tank without the need for any wiped or soldered joints.

Air Conditioning & Engineering, Ltd.

A new air velocity meter, the "Velometer" (illus.), in addition to being a portable device with attachments including the new static and total pressure jets, does the work of the anemometer, the pitot tube and the "U" gauge. The instrument is sensitive and records velocities from 20 to 8,000 f.p.m. A locking device is provided to retain certain readings, and the pointer remains at the



Alnor Boyle system "Velometer" (Air Conditioning & Engineering, Ltd.)

velocity recorded until released. On the low range the "Velometer" records the magnitude of air movement by being placed directly into the air stream without any jets or attachments; the direction can also be determined since the air must pass through the meter from left to right. Orifice and tube type "Velometers" with various attachments are also available.

In the "Zephaire" portable unit heater and humidifier forced air circulation is given by mounting a fan and motor behind a specially constructed electric heater. The fan is quiet in operation and ensures a fixed degree of temperature. The unit is provided with an automatic humidifier, the rapidity with which the moisture is released from the container depending upon the temperature and humidity of the air surrounding the outlet pipe of the humidifier. The unit is rated at 1 kW.

Bastian & Allen, Ltd.

Delegates and visitors are invited to discuss questions on thermal storage and other heating problems. Photographs are available showing the new Earl's Court thermal storage heating installation, which is claimed to be the largest in the world, and has a loading of over 12,000 kW.

Belling & Co., Ltd.

Two larger sizes of the well-known "Baby" cooker are being introduced, one (illustrated) with an oven 12in. cube and a 6½in. boiling plate on the hob, in addition to the standard boiler-griller; and one with an oven 13in. cube and with 8½in. boiling plate. The standard Nos. 43 and 44 cookers (illustrated p. 851), have been improved, and are now fitted with a removable oven lining. The method of heating the oven, too, has been altered, and low-temperature heating elements are now used. Good air circulation results in a remarkably even temperature. A new streamlined cooker is attracting a considerable amount of attention, as is also a number of built-in fires and fireplaces.

Middle-sized "Baby Belling" cooker

Benjamin Electric, Ltd.

Among a complete range of industrial and commercial reflectors and equipment for use with both gas-filled tungsten lamps and electric discharge lamps, special prominence is given to the "Ruralux" reflector for the street lighting of rural areas, and to the new range of reflectors for the new 80- and 125-watt electric discharge lamps (illus. p. 846).

Berry's Electric, Ltd.

"Magicoal" fires, as supplied to the Royal Households, are shown with a new type of air-conditioning equipment. The "Chinese Chippendale" fire illustrated on page 852 is simiar to one suplied to the Royal yacht.

Bratt Colbran, Ltd.

A working model showing the company's interchangeable radiator being moved in and out of a coal fireplace indicates the ease of removal for the use of coal when required. Wall panels and portable radiators are available in a wide range of attractive colours and finishes, and a 3-kW inset fire in a rose-tinted mentel and silver-plated surround is representative of complete fireplace units.

Geo. Bray & Co., Ltd.

Included among a range of electric heaters and refractory insulators for industrial, traction, marine and domestic use is a new tubular type of element with many applications. In some designs a novel safety cut-out is incorporated. Boiling plates, immersion heaters, strip and ring elements, radiators, refractory firebars, plain and screwed tubes, rods, etc., are also represented.

Brighton Corporation Electricity Department

This stand is arranged as a bureau where details of Brighton's electricity services are available.

British Electric Domestic Appliances, Ltd.

Special features of the two "Bedal Aerofrige" refrigerators shown, model 1 (5.3 cu. ft.) and model 3 (3.5 cu. ft.), are freedom from vibration and noise, thermostatic control, six freezing temperatures and non-interference with radio. The "Model M Bedal Astoria" electric washing machine (illus. p. 845) has totally enclosed gears, rubber mounting for the motor, and a streamline wringer control. The less expensive "B" model has not quite all the refinements.

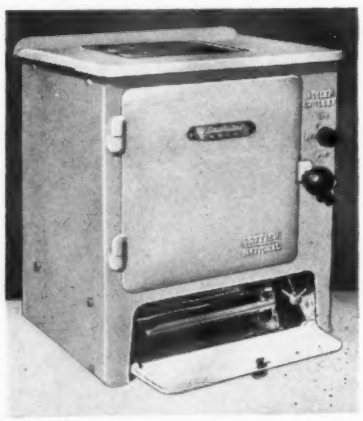
British Electrical Development Assocn.

In addition to the usual local publicity services, the Association's display is linked up with the National Refrigeration Campaign, emphasising the National Refrigeration Fortnight, June 4th to 17th. A cabinet from each of the eleven manufacturing firms which are co-operating with the Association is superimposed on a large-scale model domestic refrigerator in which is incorporated an ingenious device producing a fresh message each time the door is mechanically opened and closed. The space in front of the stand serves as a rendezvous and rest lounge.

British National Electrics, Ltd.

A selection of domestic lines includes new model inset fires, irons and toasters, etc. The well-known "C.11B" breakfast cooker is shown fitted with rapid radiant element.

In the new "SB1" table cooker, shown for the first time, space is provided below the oven for the warming of plates and dishes. A 1,750-W tubular radiant-type grill-boiler, besides carrying out all boiling, simmering, frying and grilling operations, is also available as a top heating element for the oven. As an extra, a stand can be supplied to raise the cooker to a convenient height, when it is not required for use on a table. In an alternative model a radiator takes the



B.N.E. "SB1" cooker

place of the hot-cupboard. The 1 kW rod-type element with its chromium-plated parabolic reflector is covered by a drop-down door. Provision is made for cutting off the current automatically so that only the oven or fire is in circuit at one time.

British Sangamo Co., Ltd.

The new "S.S." small synchronous time switch (illus, p. 852) has single-pole, single-throw, silver contacts and is rated at 10 A for 250 V. It can be supplied for lower commercial voltages on frequency-controlled circuits.

Apart from compactness, its features include bakelite housing and plug-in mounting, interchangeable day and solar dials, a day omitting device, an external manual operation device and the safeguard of an all-enclosed mechanism.

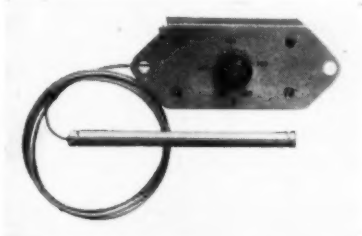
Among the electricity meters on view are the "H.M." all-insulated, single-phase meter and the multi-coin prepayment and two-part tariff meters, which are available for single-, dual- or triple-coin, single-slot operation. Other exhibits include portable test meters, polyphase meters, m.d.i. attachments, test blocks, time switches, synchronous motors and clock movements.

British Thermostat Co., Ltd.

Automatic control equipment includes thermostatic switches for both domestic and industrial installations. Among domestic models, the type "RT" room thermostat is available in a wide choice of colours. The maximum switch capacity is 15 A at 250 V, and an ingenious scale-locking device, formerly fitted as an extra, is now supplied as standard. Immersion-type thermostats are represented by types "IT" and "HT," the former being of the bi-metal type with spiralised sensitive element and 10-A snap-action switch, and the latter a vapour-pressure instrument with 20-A mercury-tube switch.

Shown for the first time is the type "SK" thermostatic switch (illus.), the high temperature model of which comprises a metal phial connected to a flexible metallic bellows by a capillary tube, the system being charged with an expansible liquid. The expansion of the liquid causes the bellows to extend and to operate a 10-A snap-action switch. This instrument is available for temperature ranges up to 600 degrees F, and is thus suitable for many industrial applications for which hitherto it has been necessary to employ instruments of the mercury-in-steel type in conjunction with relays, or the relatively expensive electrical resistance temperature controller.

Among heavy-duty apparatus, the "K" series vapour-pressure type in-



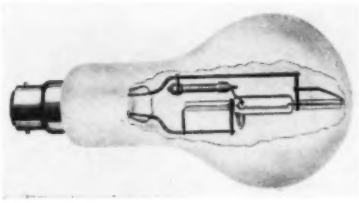
The "SK" high-temperature thermostat (British Thermostat Co., Ltd.)

struments, mounted in substantial dust- and moisture-proof metal cases, are available in various forms, typical examples including type "K5" thermostatic switch with sensitive phial and capillary tube; type "KS" with rigid stem for use as an immersion thermostat; and type "KS1" which is arranged as a pressure-operated switch. Type "HH" humidistat is of the hygroscopic strip type and is arranged to operate a 5-A snap-action switch at preset conditions of humidity. For the control of hot water and steam circulation, several forms of magnetic valves are shown, and also examples of the "Teddington" hydraulically operated motorised valves, in sizes up to 5 in. seat diameter.

British Thomson-Houston Co., Ltd.

Since the last Convention, rapid progress has been made with "Mazda Mercra" electric discharge lamps, and the new 80-W (illus.) and 125-W sizes are particularly applicable for side-street lighting. Five sizes of lamp are now available, 80, 125, 150, 250 and 400 W, each giving approximately three times as much light as a gas-filled lamp of the same wattage.

Among the extended range of B.T.H. street-lighting lanterns for use with "Mazda Mercra" lamps is the "County Junior," which has been specially designed for 80- and 125-W lamps. Installations have already been carried out in many parts of the country, and among the more important London in-



An 80-W "Mazda Mercra" lamp

stallations may be mentioned Stoke Newington, Wembley and West Ham.

Bulpitt & Sons, Ltd.

Among a representative display of "Swan Brand" kettles, percolators, irons, toasters, fires and ground base utensils for electric cookers, the following are interesting new lines:—A convector heater (illus. p. 852), a heating pad, an electric iron (illus.) with permanently fixed flex and various other improvements, plate warmers, a toaster set and a cream scalder.

Burco, Ltd.

A feature is made of the more popular types of electric wash boilers for hire and housing scheme requirements, and the "Coronation" electric washing cabinet (illus. below) is being put forward as a progressive appliance to compete with gas enterprise. The ordinary wash boiler is said to be conceding ground to this more useful appliance, which has a capacity of 10 gals., and is fitted with a hand-operated agitator and wringer, yet takes up little more space. It has a loading of 3½ kW and is provided with an automatic safety cut-out.

Cable Makers' Association

Various house-wiring systems are displayed, together with samples of rubber insulated cables and flexible cords for all purposes.

Callender's Cable & Construction Co., Ltd.

This exhibit is confined exclusively to the Callender-Lunn easy-payment box (illus., p. 846), which has been adopted by many supply undertakings for account collecting purposes. Full information about its use and details of cost, etc., will be available.

Carron Company

Among the features of the new "Carronette 2" cooker are plug-in boiling plate and oven elements and an oven (claimed to give even heating throughout) with a device for increasing the cooking capacity in an emergency. Other cookers used extensively in hiring schemes are also included in this company's exhibit.

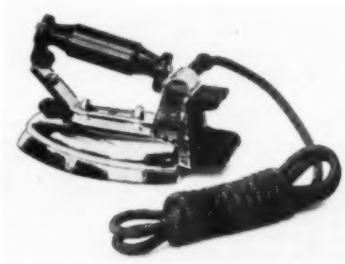
A new "utility" fire can boil and toast simultaneously, and generates both radiant and convected heat efficiently for room warming. Another new fire, a hotel prepayment meter model, is extremely compact and the meter is fitted with a credit-cancelling device. Portable fires are shown in coloured enamels and examples of fixed fires include inset and outset types. An adaptation of the "Sunglo" fire for building-in is shown in an appropriate surround. Space has also been found for breakfast cookers and irons.

Corfield-Sigg, Ltd.

The makers of the "Crown Merton" electric ware are showing an electric kettle with a new type of immersion element and automatic cut-out. Stewpans and casseroles, etc., in the new "Sunrai" finish, triple and twin pans and square stewpans are other interesting items, as well as "Zum" cleaner for all aluminium ware, electric cookers, reflectors, etc. The company is prepared to discuss ideas with visitors for hire-purchase, etc.

Crompton Parkinson, Ltd.

A complete range of the company's latest pedestal fans (described in our last week's issue, page 808) is a special feature of this exhibit. It will be remembered that forty-two of the 12-in. os-



Bulpitt connectorless iron

cillating "Silver Queen" models were used at Westminster Abbey during the Coronation.

Drake and Gorham Wholesale, Ltd.

A new heating system incorporating a circulating principle is claimed to give the new "Manchester" wash boiler (illus. p. 847) a washing machine agitation to the water without mechanical moving parts. Rapid circulation is obtained by the application of the heat to a small volume of water distributed into the wash pan by a circulator of special construction accommodated inside the heater case. The circulating heater is a self-contained unit fitted by a flange to the centre of the boiler pan bottom with a gland joint: it can be supplied ready to fix to any make of wash boiler. The boiler, which has a 10½-gallon capacity, is obtainable either in galvanised or mottled enamel finish, and is particularly suitable for hire and hire-purchase schemes.

A new range of rectangular water heaters incorporating the "Densacone" anti-scale device is now available and improvements in appearance and finish have been made to the company's round-type heaters.

Edison Swan Electric Co., Ltd.

Included among street-lighting lanterns is the new "Ediswan London Major," fitted with high-efficiency prismatic refractor globe with internal prisms. The outer surface is smooth, except for a small area on the path side, facilitating cleaning and minimising

The Burco "Coronation" and the British Electric Domestic Appliances' "Astoria" washing machines and a new Santon water boiler

dust-collection. The lantern consists of a cast-iron head with a cadmium-plated, mild-steel yoke attached to the lower end, to which is hinged a cast-iron ring supporting the globe. The spun copper canopy and vitreous enamelled reflector carry no weight, while a one-hand, vibration-proof fastener simplifies inspection and lamp renewal. The "London Minor" (illus.) is a smaller "edition." The "Northbury" (illus.) and "Stepney" lanterns embody reflector systems giving full light control in both vertical and horizontal planes. There is no waste of light and glare is minimised. The body of both lanterns is of heavy-gauge copper, as is the canopy of the "Stepney." The canopy of the "Northbury" is of cast aluminium silicon. The optical system consists of upper metal reflector in a canopy and a pair of silvered glass reflectors mounted on bottom panel.

Industrial and commercial lighting equipment includes dispersive, concentrating and angle type reflectors for both e.d. and gasfilled lamps. Two new floodlights are the "Argus" and "Vega." The former is for use with either e.d. or gasfilled lamps and is mainly suitable for illuminating the faces of buildings. The latter, for use with gasfilled lamps, is suitable for lighting towers, spires and similar structures when a long throw is necessary. The "Sirius H" floodlight, giving a wide beam of light, is designed to light high buildings with small projection, while the "Saturn" unit is constructed for the treatment of building faces and similar ornamental illumination. Particularly suitable for garages, car parks, open spaces, etc., the "Waltham" floodlight is designed for lighting both horizontal and vertical surfaces when mounted above ground level. "Royal Ediswan Escura" electric-discharge lamps are exhibited in the 80-, 125-, 250- and 400-W sizes.

In the "Ediswan" system for safeguarding telephone systems against surges induced by faults on power lines the protection is normally inert and imposes no load whatever on the line. It ensures simultaneous surge discharge on both lines and is capable of clearing heavy discharges without detriment to the system or to the protector. Normal working conditions are restored immediately after the surge is cleared.

Electric Lamp Manufacturers' Assocn.

This stand is largely devoted to important advances made in electric-discharge lighting, which is being used increasingly not only for streets, where there are already 36,300 e.d. lamps in use, but for factories and floodlighting. Examples of these lamps include the high-pressure mercury-vapour types in the new 80- and 125-W sizes which give an initial output of 3,040 to 5,000 lumens, and special units have been constructed so that visitors can see the details of the lamps while they are alight. The stand also includes three dioramas showing the applications of discharge lamps to industrial, street and floodlighting. Among new ideas in showroom equipment are a new stainless-steel light-vision demonstrator which operates with only a 100-W lamp, and also a complete fitting comprising an armchair, floor standard, and built-in light-measuring apparatus especially designed for demonstration purposes in electricity showrooms.

Electric Vehicle Committee of Great Britain

Details of the composite display of battery-propelled vans, accumulators and charging equipment appears on page 853.

Electrical Apparatus Co., Ltd.

A full range of house service meters includes single- and poly-phase models of the ordinary quarterly type and also a series of prepayment-pattern meters for single- and two-part tariffs. All instruments meet the requirements of the new Electricity Meters Act. They are of long-range pattern and are provided with strongly reinforced moulded bakelite cases which, together with completely rust-proof finish afforded by cadmium plating of all ferrous parts, is claimed to give perfect insulation and complete freedom from corrosion.

A unique feature of the prepayment meters (illus. below) is that a wrong coin inserted can be cleared merely by pressing a button and, instead of being passed through to the coin-box, is returned direct to the consumer. All the nine varieties of prepayment meter are standardised units built into common bakelite cases, thus facilitating subsequent interchange of meters if required.

The two-part tariff meter is very compact and is provided with an easy price-change device. A large-capacity switch, having a quick make rolling action of the renewable silver-plated contacts, is mounted in an accessible position on the front of the mechanism.

Electrical Association for Women

The background of the stand consists of six decorative panels illustrating various aspects of the work of the Association and the help it can give to the housewife, business woman, demonstrator, teacher, home worker and schoolgirl. Three new charts, prepared specially for schools, show the construction of an electric iron, cooker and washing machine. Samples of publications are mounted on attractive showcards.

Electrical Contractors' Association

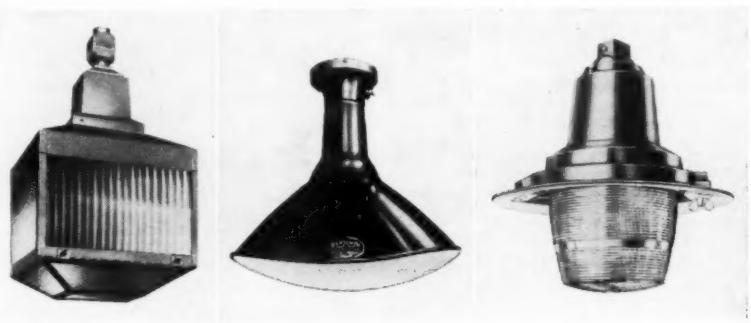
In a small lounge supply engineers and committee men can discuss any supply or wiring problems. The Association has published a small Convention booklet entitled "Load Building: The Secret of Success."

Electrical Industries Benevolent Association

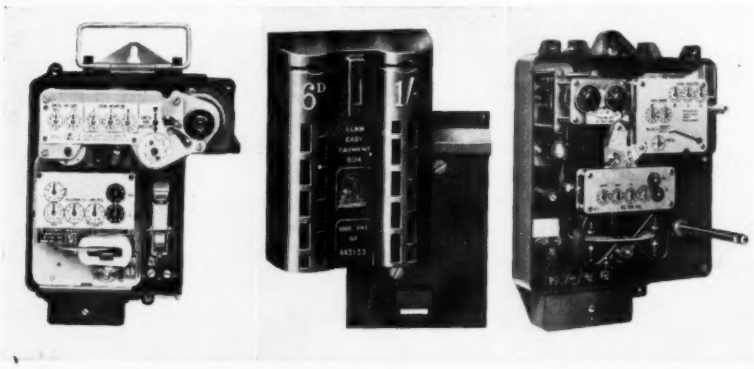
Flag-day collections will be made on the opening day, and it is proposed to hold a golf competition for which a challenge cup has been presented. Literature and propaganda materials are to be found on the stand itself.

Elexcel, Ltd.

Included among various types of cookers, breakfast cookers, wash boilers, fires, water storage tanks and other "Xcel" domestic appliances is a new range of electric space-heating apparatus of various types to meet all requirements, particularly for shop heating. The apparatus is suitable for heating kiosks, closed shops and open shops. In the first case tubular and skirting heaters are appropriate, while in the second tubular and skirting heaters fitted behind the counter, or panel heaters fixed on walls or suspended by chains, provide local radiant heat. Convectors suitably placed offer another solution. For open shops panel heaters are used. The skirting heaters, a new range of which was described and illustrated in last week's issue (page 807), are designed to mount on the existing wooden skirting boards or direct on to walls in the case of a new building. They are available in one-piece lengths from 2ft. to 12ft. in single- or double-tier units, and they give front surface temperatures of approximately 200 deg. F. and rear temperatures of approximately 130 deg. F. Low-temperature panels are included in the range. Both portable and inset convectors are used where space restriction makes the installation of tube and skirting heaters impracticable. They provide a flow of heat warmed to 200 deg. F. at a speed of 140 ft. per minute.



Left and right: The revised "Ediswan Northbury" and the "London Minor" lanterns. Centre: Benjamin vertical elliptical-type reflector for 80-W e.d. lamp



Dual-coin prepayment meter (Electrical Apparatus Co., Ltd.), a Callender-Lunn easy-payment box and the "TMP2" fixed charge collector prepayment meter (Measurement, Ltd.)

Ellison Insulations, Ltd.

Samples are shown of "Tufnol," a non-metallic, homogeneous material, equal in tensile strength to aluminium but only half the weight. It is primarily a Grade 1 electrical insulator, but its many other properties render it suitable as a constructional material. Impervious to water, steam, oil, petrol, most acids and chemical fumes, it can be used without risk of deterioration in any atmospheric conditions or climate. Moreover, it can be sawn, drilled, tapped, screwed, punched and otherwise machined exactly as metal.

Examples of machined "Tufnol" include a tramway skate with "Tufnol" insulation, a tramway handrail insulator, cooker switch parts (illus. p. 849), a brush rocker for an electric motor, conduit, bell and ball strain insulators for power lines, bobbins, and gears for small electrical apparatus such as meters and clocks.

English Electric Co., Ltd.

The new "Ritemp" automatic oven control is available on cookers HC212 (illus. p. 851), HC213 and MC206A, and will be provided on all future models in this range. A blanked-off hole permits the insertion of the thermostat rod into the oven, and there are means for mounting the thermostat in the switch-box compartment. The regulating knob with dial-plate is interchangeable with the standard three-heat switch.

New season's fires incorporate a number of new features, the range embracing "coal-effect," portable, reflector, inset and direct wall-mounting types. The 1½-gal. water heater is typical of the company's water-heating appliances. A special model washing machine with glass front and sides enables visitors to see the movement of the agitator. The

standard model (illus. below) is now fitted with a new streamlined wringer, having two medium hardness rubber rollers of special construction running in two hardwood bearings, impregnated with oil. Finger-tip instantaneous release can be operated from either side of the wringer by striking a horizontal bar. An automatic drip-tray and an ingenious discharge hose are other attractive features.

Falk, Stadelmann & Co., Ltd.

Advantages claimed for the new "streamline" oven fitted to "Servis" cookers are:— Extreme reliability; easy cleaning; no elements, connections, etc., in oven; quick heating; and maximum space factor. The elements, which are formed of steatite segments and which carry the heating spiral, are inserted and withdrawn from the troughs horizontally through the back of the cooker, other patented features of the "Servis" cooker being the hob catch, plug and socket and oven wiring.

A comprehensive range of "Efesca-Surves" fires contains both portable and inset types, and among other labour-saving appliances for the home is a new aluminium kettle fitted with a tubular immersion element and an automatic cut-out.

An entirely new range of water-heating apparatus consists of a new patented thermo-circulator with non-sagging elements threaded through refractories. These elements are housed in separate chambers around the circulator, and are readily accessible and removable. The circulation is set up by a patented device which considerably reduces furring. This device consists of metal slides which can be easily removed and cleared. The range of immersion heaters is made on the same lines as the thermo-circulators. Storage water heaters are available in pressure, non-pressure and cistern types in both cylindrical and rectangular patterns.

Ferranti, Ltd.

A selection of pressure and non-pressure water heaters ranges from 1½ to 12 gals. A 5-gal. water boiler has been designed to meet the special requirements of cafés and hotels to give large supplies of hot water constantly. A barber's type heater with hose and spray attachment is shown, together with immersion heaters and thermolators from 12in. to 42in.

There are representative models of this season's fires, and in the clock section are to be seen mantel clocks with wooden cases, wall-type clocks, illuminated dial alarm models, and new striking and chiming clocks (illus.).

Among the instrument exhibits are several small panels of 2½-in. instruments and multi-range d.c. test sets, and also two circuit testers and clip-on ammeters. The improved self-starting synchronous motor, as used in time switches, two-part tariff meters, timing elements in maximum-demand indicators, etc., are demonstrated. The circuit tester No. 2 has a resistance of 2,000 ohms per volt and measures capacitance. There are two ranges for resistance testing.

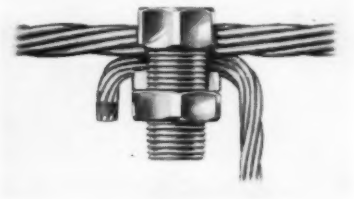
General Electric Co., Ltd.

"Magnet" cookers with thermostatically controlled ovens, radiant boiling plates and simmering devices are displayed in a range of attractive colours. Industrial cooking equipment is now available in a new finish. A skeleton model shows constructional details of "Coldair" refrigerators. A washboiler with an automatic reset device (illus. below), a vacuum cleaner and a "Little Wonder" brush are other domestic items.

"Osram" and "Osira" lamps, together with standard types of street-lighting, industrial and floodlighting fittings, show the latest advances in illumination technique for outdoor and indoor application. Special attention is directed to the new 80- and 125-W "Osira" lamps for industrial or side-street lighting as well as to the new 85- and 100-W "Osira" colour floodlighting lamps and their housings.

Goodliffe Electrical Supplies, Ltd.

Overhead line fittings include a range of "Goodtric" line taps suitable for all



A "Goodtric" line clamp

sized conductors, as well as "Goodtric" line clamps (illus.), which are fitted with silicon bronze anti-corrosion bolts for use with conductors up to 0.15 sq. in. Also on view are various types of clamps

A Ferranti chiming clock

made from gunmetal and silicon alloy, tension and non-tension joints, draw tongs, etc.

Greene, Phillips & Co.

A new range of "P.H." low-temperature convectors is available in attractive oak, walnut and mahogany cabinets, and also in artistic metal cases.

Hague & McKenzie, Ltd.

This company now makes over 170 "Pyramid" aluminium utensils specially constructed for electric hotplate cooking, and every one is made by steel dies throughout. The "Wagtail" electric kettle (illus.) has now been developed into a fully automatic mechanically operated safety model. The "Swift" electric kettle, with thermostatic safety device is also shown, together with the "Rhythmic" electric iron and "Pyramid" electric toaster.

The "Pyramid Wagtail" kettle

Harcourts, Ltd.

Combined heating and lighting units are specially featured and two outstanding examples are the "Heatlite" floor standard (illus. 852) and ceiling pendant. Other fittings exemplify the efficient and economical application of the mercury-vapour electric discharge lamp to standard commercial lighting units, included among which are an adaptation of the company's "Reflecto" pendant, a new universal adjustable type "Floodray" reflector, and "X-Ray" reflector unit. These are a few of tthe features interesting exhibits are standards for sewing machines, telephones and desk calendars.

L. G. Hawkins & Co., Ltd.

A removable "Baskador," tap latch, nine-point cold control, large ice-cube capacity, drawer-type "Vegetainer," and only three moving parts in the freezing unit. These are a few of the features of the four 1937 model "Universal" refrigerators. A sideboard food server is a recent addition to the range of "Chevalier" pattern matched appliances, which include coffee percolators, toasters, automatic waffle makers and sandwich toasters.

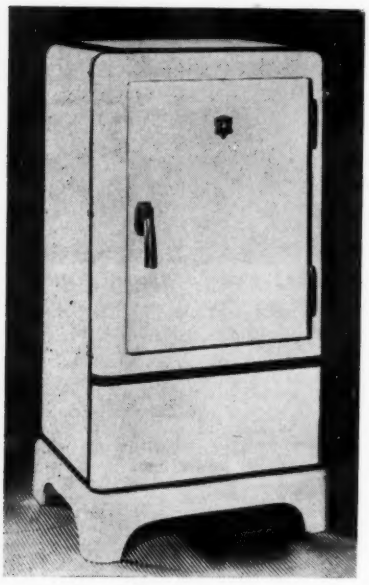
Other interesting "Supreme" and "Universal" appliances are washing machines, vacuum cleaners, kettles, toasters, irons, radiators, coffee percolators, "Sunray" electric fires, "Supreme" lighting fittings, table standards, and "Tecal" equipment, "the tea, time, light, call and shaving-water robot."

Heatrae, Ltd.

Many important developments have been made in water-heating equipment

Some of the latest domestic laundry apparatus: The "J. M. Mayfair" washer (Macgregor & McCallum, Ltd.), the "Manchester" circulating wash-boiler (Drake & Gorham Wholesale, Ltd.), the English Electric "H.A. 333" washer and the G.E.C. "D4753" wash-boiler

since last year's Convention, and examples are shown of an entirely new departure in apparatus for housing estates. Additional types of rectangular heaters have been designed to meet new



The Moffat M32 refrigerator

conditions, but they do not lessen the popularity of standardised models, such as the cylindrical non-pressure type heater, the round and flat cistern types, and the floor-pattern pressure model. Immersion heaters of the circulator and horizontal working types are available for either hand switch or automatic control.

Attention is particularly drawn to a new double-wound auto-circulator, in which the position of the heat zone can be adjusted according to immediate needs of the housewife merely by turning a switch which operates in conjunction with the thermostat.

A working model shows supply engineers the type of display which the company offers for use in their own showrooms.

The "Chalet" model self-contained wash-basin cabinet, complete with water heater, several of which have been supplied for holiday camps, etc., is of interest, while the "safety first" air warmer and towel rail for the bathroom, typical air convectors for domestic and industrial use, radiant fires, and an immersion heater for working on a 750V to earth circuit are other items on view. Water-heater interiors show the advance made in the use of monel metal.

W. T. Henley's Telegraph Works Co., Ltd.

The new "Sharborn" relay is of particular interest to engineers dealing with street lighting or with the remote or automatic control of public building lighting, sign and shop-window lighting, space and water heating, etc. It is described elsewhere in this issue.

An interesting demonstration board illustrates how, with the "Cascade" system, it is possible to switch on the street lamps of a small town or a section of a large town by closing a small tumbler switch.

A novel H.M.V. room heater

H.M.V Household Appliances

A room heater of revolutionary design (illus.) is the outstanding exhibit on this stand. Resembling in appearance four mushrooms one on top of another, the heater circulates the hot air round the room by means of a fan, which can be used either with full or half heat or by itself in warm weather. It is solidly constructed of vitreous, enamelled steel, but is easily portable. There is no danger of burning or scorching since the heating element is entirely enclosed. Available in 2- and 3-kW loadings, the heater is finished either in shaded fawn or chromium.

A new 8.08-cu. ft. low-temperature refrigerator accompanies the popular 3½-cu. ft. model 326. Demonstrations are given of electric washers and the controlled heat iron, a model kitchen containing representative examples of H.M.V. household equipment.

Holophane, Ltd.

The new "Bi-way" refractor for 400-W mercury e.d. lamps (illus.) is one of the lighted display units, which also includes a double-panel refractor lantern for 150-W sodium lamps, a "Duo Dome" lantern with 500-W gasfilled lamp, and a "Duo Dome" refractor adapted to take the new 125-W mercury e.d. lamp.

The stand is indirectly lighted by a 300-W "Auralite" fitting. Among floodlights are the new vertical burning types introduced for the Coronation. The "Rhyl" flood has been specially designed for the decorative floodlighting of

A Holophane "Bi-way" refractor

gardens, parks and seaside promenades.

Prismatic glassware is available in a large number of prism designs to suit various lighting requirements. A full range of street lighting glassware and the Holophane-Edgcumbe auto-photometer and Holophane lumeter complete the display.

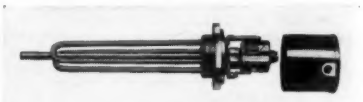
Hoover, Ltd.

A "stroboscope" clearly shows the beating, sweeping and cleaning action of the Hoover, and, in addition to a display of sectional machines, there is a board outlining the various phases of development of the cleaner from the old-type brush roll to the present-day agitator.

Hotpoint Electric Appliance Co., Ltd.

The main items of this exhibit are cookers fitted with "Torribar" radiant boiling plates, a washing machine, a washing-up machine and automatic immersion heaters. A feature of the 4-heat "Torribar" plate is that, the heat content being comparatively low, the temperature falls quickly after the switch is turned to "simmer," so that the contents of saucepans quickly fall off from fast boiling. On "simmer" about one-tenth of the full load of the plate (1,600 W) is distributed uniformly over it.

A range of washing-up machines, which all operate on the same principle, meets the requirements of large private houses, hotels, restaurants or canteens. The washing up is carried out by two moving arms, which spray hot water at high speed on to the plates. The arms are moved entirely by the reaction of the water itself, and there is no complicated mechanical drive. Rinsing is carried out by hot water directed by another pair of arms. The pieces to be washed are loaded into trays and passed through the machine, the time for washing and rinsing each trayful being only about 45 seconds.



Hotpoint 2-kW automatic "Torribar" immersion heater

The construction of the 2-kW automatic "Torribar" immersion heater (illustrated above ensures high efficiency and immunity from breakdowns. The thermostat and "Torribar" loops are mounted on a brass hexagonal head, and the terminals are protected by a neat metal cap.

A model of a scientifically planned kitchen is shown and full information is available regarding the company's kitchen planning service.

Hurley Machine Co., Ltd.

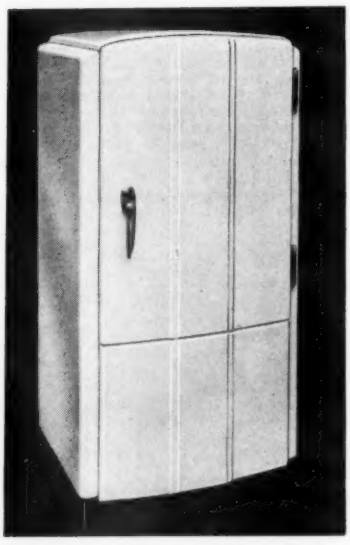
Among a representative display of "Thor" products, the principal item of interest is the "Coronation" washer, a streamlined machine of attractive design incorporating an improved and still safer wringer and also a new type of agitator giving a faster and more effective washing. The tub will take 9 lb. of dry clothes. Further particulars relating to this machine appeared in our May 14th issue, page 734.

Victor H. Iddon, Ltd.

Of special interest are the company's new angle battenholders, a cordgrip holder with locking device to prevent accidental turning of the sleeve, a robust industrial type of bakelite which will withstand all heat and other unfavourable conditions, combined ceiling roses, and a new range of ceiling fittings as fitted in the London Fire Brigade's new headquarters.

International Refrigerator Co., Ltd.

Besides examples of complete B.T.H. refrigerators and a display case of parts of the hermetically sealed mechanism incorporated in all models, there are photographs of manufacturing operations at the Rugby works. In design, capacity and price, the cabinets are very suitable for supply undertaking marketing. Parts undergo gauge tests of 3/10,000ths of an inch tolerance, and among the other



A 5-cu. ft. B.T.H. refrigerator (International Refrigerator Co., Ltd.)

twenty tests to which every unit is subjected are submersion in water, volumetric efficiency test, and a test in a hot room, where each unit is subjected to a long period of full-load working at 100° F. Employing forced-feed lubrication, the apparatus requires no oiling or maintenance, and the units of the "FT" and "GL" series are covered by an unconditional five years' guarantee.

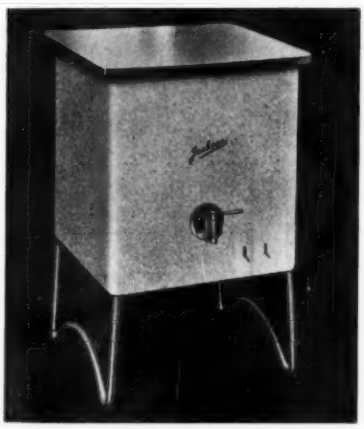
In the latest 3-4 and 5 cu. ft. models (illus. p. 848) the units are housed in the base instead of on the top of the machine. The cabinet is of all-steel construction, the "super-freezer" is of stainless steel, and all models have a nine-point temperature control, defrosting switch and on/off control switch.

The company's policy of sales promotional and merchandising assistance gives practical help to supply authorities. Supplies of literature overprinted with local showroom addresses, advertising blocks and layout service are all available without charge. In approved cases contributions to local advertising and exhibitions are available, and a system of sales training at the showrooms of supply companies can also be arranged without charge.

Jackson Electric Stove Co., Ltd.

Since the "90" series domestic electric cookers were introduced five years ago over 175,000 have been sold. The complete range is on view, including an example of the "90J" model, with the hob arranged alongside the oven, and adapted for mounting on a refrigerator. All the ovens have plug-in elements arranged in the sides of the oven, and "90" series elements are interchangeable with those supplied with the first models over five years ago. The latest "100" series cookers have been produced specially to meet the requirements of certain supply engineers and have bottom heat and a clear oven interior. The oven elements are plug-in throughout and the hob and hob details are identical and interchangeable with those supplied with the "90" cookers.

Square and round type washboilers complete with white enamelled flat-topped lid, forming a table top, and "Perco-Wash" device make an interesting exhibit. The square type (illus.) is now available with tubular legs. Electric fires in various coloured vitreous enamel finishes include light cast, portable reflector and inset types. There is also an example of the firm's thermal storage water heaters which conform generally to the E.D.A. Water Heating Committee's recommendations.



A square Jackson wash-boiler with tubular legs

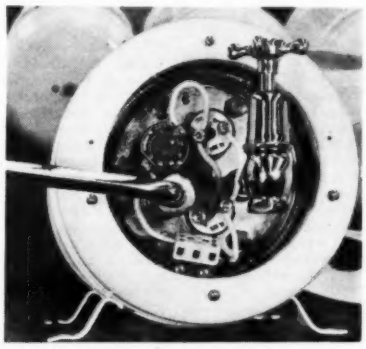
Johnson & Phillips, Ltd.

Exhibits on this stand are confined to "Charlton" water heaters, including new and improved designs for vertical cistern-type heaters and horizontal or ceiling type heaters; new 1½, 3- and 12-gal. cylindrical non-pressure heaters complete with rod-type thermostats; barbers' heaters; circulators and immersion heaters.

In the new 1½-gal. cylindrical heater (illus.) two 375-W elements are fitted, together with rod-type thermostat. When the heater is used on d.c. a special condenser is fitted and connected across the terminals of the thermostat. Two elements (600 W each) are also employed in the similarly designed 12-gal. cylindrical non-pressure heater, outstanding features of which are its attractive appearance and accessibility of all parts.

To allow engineers to inspect new products on the transmission and distribution side the company has taken the first floor of the Savoy Cinema. Switchgear exhibits comprise a draw-out truck-type cubicle with a "F.A.XI." breaker untouched after successfully passing the short-circuit tests to B.S.S. 116/1936; a vertical isolation draw-out metal-clad unit; type "D" switch fuses in 660-V, 11-kV, 22-kV and 33-kV sizes; "A.2" and "L.3" industrial-type oil circuit breakers; a "V.D.2" oil-immersed circuit breaker; and a complete automatic on-load tap changer.

Pole-mounting and flameproof mining-type transformers are both represented and a working display unit of static condensers demonstrates by meter readings the saving which can be made by power-factor improvement. Among cable accessories is a new universal terminal and dividing box (illus. below) which can be



J. & P. 1½-gal. cylindrical heater

used in practically any position. A complete outdoor pole-mounting sub-station is equipped with "D" fuses and crystal valve lightning arrestors, &c.

J.P. Tubular Heater Co., Ltd.

This company's tubular heater lends itself to a simple and unobtrusive arrangement of heating system for all types of buildings, such as theatres, cinemas, warehouses, offices, houses, steamships and industrial purposes. Outstanding advantages claimed are: Low installation costs, competitive running costs, maximum safety, no fire risks, cleanliness, high radiant properties, ease of control, and even distribution of heat. These heaters are assembled in various forms, such as car heaters; towel rails; radiators of all designs, including a shaped heater for special locations; and high- and low-temperature panel heaters.

The J.P. electric flexible immersion heater (illus. below) incorporates many exclusive features. It is in itself an automatic circulator at all times, thus ensuring a constant supply of hot water. The watts dissipated per sq. in. vary from 2 to 6, according to lengths and loadings, thus giving an unusually large surface for heat transference.

Kelvinator, Ltd.

Domestic refrigerators are represented by the 5.16-cu. ft. model "GR-557," features of which are large ice-cube production (80 cubes), five purpose control panel (fast freezing, holiday setting, start, stop and defrosting), twelve freezing speeds, automatic defrosting switch, porcelain vegetable crisper, sorting shelf and rounded corners inside and out. Three other models are available with capacities of 4.15, 5.16 and 7.18 cu. ft.

The Kelvinator "1FH3" ice-cream freezer

The smallest of the company's range of ice-cream freezers, model 1FH3 (illus.) is also shown. It has selective temperature control of the freezer-hardener tank and the storage compartment tank, novel scraper gear, a recessed control panel, moulded bakelite lids, and stainless steel top. Refrigerant cooled cylinder heads on compressors and porcelain-lined food storage compartments are provided on some of the larger models.

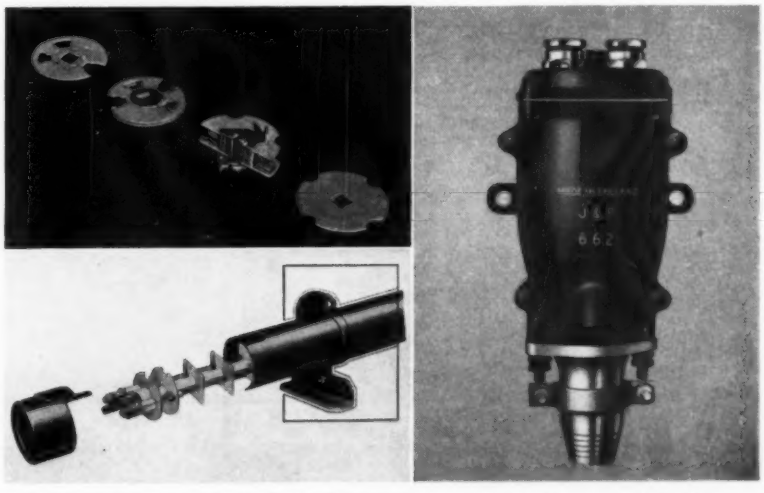
Lightfoot Refrigerator Co., Ltd.

Representative of the wide range of Westinghouse refrigerators, three models, FDS.32, FDS.40 and FD70, incorporate many outstanding features, including fast freezing "Sanalloy Froster" and seven-point temperature selector, and the "Built-in Watchman" device which automatically switches off current when accidental electrical disturbances might overheat the unit and switches on again when the danger is past. The all-steel cabinets have no crevices, rivets or hooks, and all corners are rounded for easy cleaning, ample space being provided for bottle storage.

New Westinghouse domestic appliances include a "Food Crafter" for practically all food preparation tasks, a roaster grill occupying only 2 ft. of shelf space, "Adjustomatic" streamlined irons, coffee percolators, automatic waffle irons, electric clocks of entirely new design, including a numeral timepiece, and vacuum cleaners.

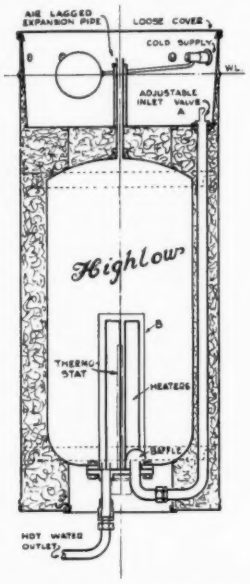
Archibald Low Electrics, Ltd.

The "Highlow Scallak" water heater, which has been designed for hard-water



Top: Cooker switch parts (Ellison Insulations, Ltd.). Left: A Siemens tubular heater. Right: The new J. & P. universal terminal and dividing box

districts and is fitted with a special patented indirect heating element, is shown in section. In a new design of combined cistern-type water heater



The "Highlow" combined cistern-type water heater (Archibald Low Electrics, Ltd.)

(illus.) the cold water supply is taken to the bottom of the inner container by means of a pipe fitted in the lagging between the inner container and the outer casing. This pipe is fitted with an easily accessible coupling so that the base-plate with the element and thermostat, &c., can be removed. The expansion pipe is insulated from the cold water in the cistern. The cistern itself is insulated as well as the water container. The constant-temperature type can be easily altered to the constant-volume type by removing an adjustable inlet valve, and instead of taking the hot-water outlet from the bottom of the inner container, fitting a pipe to this connection up to the top. The inner container is the same size and design as for the equivalent pressure type and will withstand a test pressure of 120 lb. per sq. in.

Other items of interest are water heaters for hairdressers' saloons fitted with many valves and twin sprays, pressure-type water heaters, side and top entry type circulators, immersion heaters and thermostats.

MacGregor & McCullum, Ltd.

The "JM Mayfair" washer (illus. p. 847), which replaces last year's "M" model, has an extra large capacity tub (slightly "bottle-necked" at the top and corrugated for strength) and incorporates a new type of rubber-mounted motor, which needs no oiling. The wringer has 2¼-in. diam. rolls which run in self-lubricating metal bearings, the metal parts being finished with extra thick cadmium plating. The wringer has an automatic tensioning device and a greatly improved safety release. Another model, the "M3" gyrator machine, has a special streamlined air-lagged tub.

The new "G3 Magic" vacuum cup washer has its streamlined body finished in white, or cream and green, and is air lagged to conserve heat. This machine also incorporates new types of motor and a wringer with special safety features, and automatic reversing drip trays are provided. The "Magic Major" in biscuit finish and model "F" are both shown with improved wringers and a new model "JM" is introduced with a slightly larger tub than model "F."

The "Filordrain" suction attachment is available for filling and emptying the tub, and an improved wringer post ironer can be attached to any model.

Donald Macpherson & Co., Ltd.

In the past the finishing materials used have varied in methods of application and drying time to a point where their use on a standard heat run in a conveyor has been impossible. The whole of the finishes displayed on this stand are suitable for one standard heat run in a conveyor of 45 minutes at 240-250 deg. F.

Measurement, Ltd.

In addition to the well-known type "Z" quarterly pattern meter in both metal and bakelite casings, this company is exhibiting its all-bakelite cased prepayment meter which is available for both a.c. and d.c. This instrument can be supplied for triple, dual or single coin insertion, and can easily be converted from one to the other by the removal or addition of the necessary coin selector arms. Apart from the standard prepayment meter modifications are shown in the form of a two-part tariff prepayment meter (illus. 846), with a low consumption synchronous motor, a manually operated step-rate prepayment meter, and the new time-controlled step-rate prepayment meter (see May 7th issue, p. 698). D.c. quarterly pattern meters up to 40 A are available either in bakelite or metal cases.

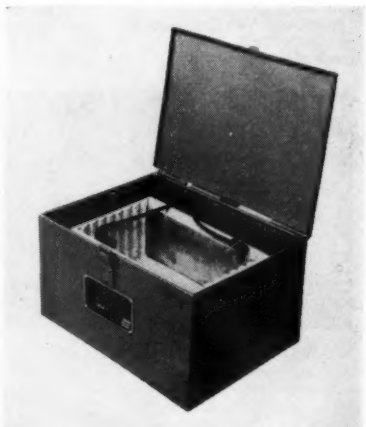
Metropolitan-Vickers Electrical Co., Ltd.

Among several new forms of tubular-type radiant heating elements is an immersion-type heater with a novel arrangement to facilitate fitting and grouping. The two ends of the element are separately fitted with screwed nipples for clamping in the tank or mounting plate. The elements themselves can be supplied in almost any shape. Another novel form is a heater for fitting in the thin cylindrical cavity in calender rolls. The heater lies within the cavity and is supported outside the roll at each end, the heat being applied by radiation. This arrangement of stationary heater obviates the use of slip-ring connections. The heaters can be supplied for use in bores as small as 2 in. diameter.

A demonstration bus-bar protection panel is arranged for duplicate bus-bar system with teed-off feeders and has its protective relays operating on the frame-leakage and balanced systems of discriminative protection. A new form of automatic voltage regulator of the silver-carbon stack type is offered at a moderate price for use with generators of small and medium capacity. The device is simple, robust and requires little maintenance. New meters, relays and precision instruments are also exhibited.

The Lamp Department shows recent developments in fittings for street lighting and floodlighting, particularly for e.d. lamps. "Cosmos Decora" strip-lighting is also displayed.

The company is also exhibiting electro-horticultural equipment marketer by the Electro-Horticultural Equipment Co., Ltd. A midget size soil pasteuriser (illus.) has been designed to meet the requirements of amateur gardeners who have realised the advantages of employing pasteurised soil, and composts for seeding and potting purposes. The amount of electricity used varies from 1 to 1½ kWh per cu. ft. of soil pasteurised. A bulb pasteuriser, low-surface temperature heating equipment for greenhouses, including both panel-type heaters and low-voltage strip-type heaters, and also electric fumigators and



Electro-Horticultural Equipment Co.'s soil pasteuriser shown on the Metro-Vick stand

electrically operated insecticide sprayers are also seen.

Moffats, Ltd.

Electric cookers include two new, popular-sized models, designed with a view to improved performance and lower maintenance. The "Therm-o-matic" oven regulator with "Thermal Eye" and the embedded "Redspot" annular boiling plates are prominent features. The three refrigerators shown (M32, M45, M66, with capacities of 3.2, 4.5 and 6.6 cu. ft. respectively) are all streamlined and are finished inside and out in porcelain enamel.

Premier Electric Heaters, Ltd.

Apparatus shown includes "Smoothwell" and "Laundwell" irons, "Quick-

Premier warming plate, percolator and toaster

set" and "accident-proof" kettles, as well as imitation coal and ordinary-type fires. A new toaster and a new iron are being placed on the market by the company.

Pressed Steel Co., Ltd.

Improved appearance and extra low electricity consumption are claimed for this company's new season's refrigerators, which are available in four sizes—

A 4.5-cu. ft. "Prestcold" refrigerator

3.6, 4.5 (illus.), 6.7 and 9 cu. ft. The modern streamline cabinets are constructed of rustproof steel, finished in cellulose white lacquer, while the porcelain-enamelled interior has rounded easy-to-clean corners. Extra large capacity cooling units with cold control give eight freezing speeds. The compressors are quiet and automatic and need no attention beyond oiling once a year. The three largest models of "Prestcold" refrigerators are fitted with interior lights —a great convenience.

Radiovisor Parent, Ltd.

For the first time visitors can see the company's patent flame failure control apparatus for use on oil furnaces. This apparatus, which shuts down the burner completely within 2 to 3 seconds of the flame failure, does not depend upon the heating action of the flame for its correct operation, but upon the light rays emitted when combustion of the oil takes place, in conjunction with a light-sensitive cell and relay. Failure of the flame brings the apparatus into action as above, simultaneously cutting out the oil pump, air fan and igniter supplies with audible or visible warning, if desired, until the apparatus is reset by hand.

Lighting control units, which are being increasingly used for the control of street lighting and the illumination of traffic islands, directional signs and bollards, are now being applied to the

lighting of offices, factories, sidings and yards; also the illumination of advertisement signs, and staircases and corridors of flats, etc.

The Radiovisor industrial smoke indicator, which is the result of eight years' research work and experience under actual working conditions, is being employed in many power stations, as well as in industrial and commercial concerns. A counting device shown, in addition to being used by many industries for checking articles passing on conveyors, is also counting vehicles; it has recently been installed in some electricity showrooms to indicate the number of visitors, and possibly assess the attractive value of any particular display.

Revo Electric Co., Ltd.

The latest range of electric cookers is shown fitted with "Radiant" boiling plates, as well as 3- and 4-heat solid plates and "Superspeed" types. The "Coronette," a new small-house cooker, specially produced for Coronation year, is seen among a selection of household appliances.

Evidence of the progress in design of street lighting equipment is given by the latest sodium and mercury-vapour lamps. Extensive use is now made of prismatic and lenticular glass, as well as the Revo patented faceted silvered mirror reflectors, and a wide variety of units is available for all sizes of lamps.

A. Reyrolle & Co., Ltd.

Large coloured reproductions of electric thermal-storage heating equipment installed in such buildings as civic centres, offices, swimming baths, cinemas, etc., indicate the growing popularity and progress of this comparatively new form of heating. Domestic water-heating equipment and steam-raising equipment for industrial purposes are similarly illustrated.

The "Earthometer" (illus. p. 852) demonstrated, is a portable instrument for measuring the impedance of a consumer's earth circuit right back to the supply sub-station, including the sub-station earth, by means of a very quick and convenient test giving a direct reading in ohms. Once this reading is taken, the current that can flow under fault conditions is easily calculated, and this enables suitable protective equipment to be installed. Where the earth circuit impedance is high, as in rural areas, the fault current may be so limited that the fuses normally fitted for protection would fail to blow, with the result that a dangerous potential would be set up on the framework of the faulty apparatus, and would probably be unnoticed until someone received a shock. Adequate protection of such circuits is ensured by the Reyrolle earth-leakage-trip switch, which is designed to operate with an earth current of as little as 20 milliampères.

With the completion of the grid and the interconnection of systems, the increasing magnitude of fault currents makes it necessary for special care to be taken, and often cartridge fuses have to be installed in many positions where, previously, semi-enclosed fuses were satisfactory. Among the high-breaking capacity fuses for industrial and domestic use shown are a universal pattern suitable for link disconnecting boxes and for fitting fuse-carriers of other makes.

Rheostatic Co., Ltd.

In view of the interest now shown in thermostatically controlled domestic

Satchwell type "Y" immersion thermostat (Rheostatic Co., Ltd.)

cookers, a number of charts show the results obtained with type "CS" cooker thermostat in the more common oven designs. Other charts indicate the effect of putting the instrument in various positions and the different results obtained with widely differing oven interiors.

Immersion thermostats type "Z" and "Y" (illustrated above) cover the whole range of electric water-heating requirements. Modifications have been made to the type "Q" room thermostat so that it can be applied more widely for electric space heating. Besides the standard domestic model suitable for a.c. loads up to 3 kW, a similar model is shown for d.c. supplies up to 1½ kW. A special feature of an industrial model is that it is totally enclosed and practically dust-tight; it is now being widely adopted for the control of unit heaters in factories.

Among other instruments displayed are an electric convector control (suitable for installing inside the unit), a thermostat for soil heating, a watertight thermostat for greenhouse work, relays for the important application of street lighting, and a range of electrically operated valves for the control of central heating.

Santon, Ltd.

A completely redesigned water boiler embodies the main principles of its predecessor, but has been rendered even simpler and more reliable. The sizes listed have been added to, and in addition to the mottled grey finish a chromium-plated model has been introduced. Working models are available for inspection.

The latest "N.P.T." heater (illustrated)) ensures a complete absence of drip, immediate cut-off, and avoidance of the heavy gush of water which makes filling a cup difficult. A new mixing valve incorporated in the company's thermal spray and hairdressers' equipment, apart from providing a definite and certain means of mixing, obviates waste of water. Other thermal storage and quick service heaters in various finishes demonstrate the completeness of the range. To the list of circulators has now been added a side entry type.

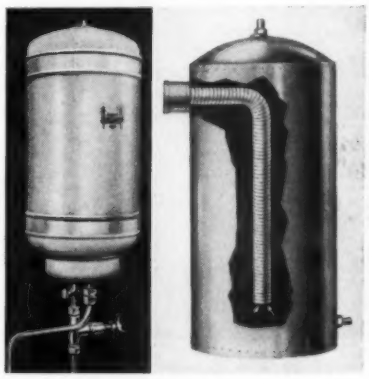
Control units in various forms are on show, finishes including walnut, white green and mottled grey.

Servis Electric Washing Machines

In addition to the well-known round "Servis" electric washer, the recently introduced cabinet model "F" is featured. Of square, modern design, with no corners, the cabinet is easily kept clean, and it has a compartment at the bottom for holding the wringer and wringer guards when not in use. A neat handle is fitted at the top for controlling the agitator and motor. The vitreous enamelled drum has an anti-splash rim and rubber beaded head. The wringer has a quick-release lever and is designed to give equal pressure on the entire length of the rollers.

Siemens Electric Lamps & Supplies, Ltd.

In addition to cookers (illustrated below), electric water heaters, tubular heaters, fires, kettles, irons and other domestic appliances there is a display of standard house service meters, including special cooker demonstration instruments. Special types of switchgear comprise earth leakage trip switches, together with switch-fuses and cooker control units incorporating earth leakage switches. Electric discharge lamps of various sizes and types are shown for street, industrial and floodlighting purposes, together with lanterns, reflectors, floodlighting units and a representative



Santon 1½-gal. "NPT" heater and the J. P. Tubular Heater Co.'s flexible immersion heater

range of filament lamps. Examples of soil-heating cables are also to be seen.

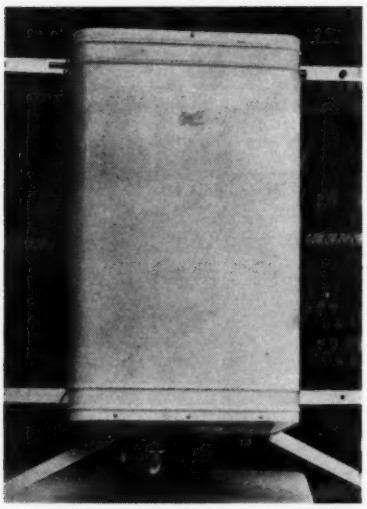
A special feature is made of tubular heaters (illus. p. 849), which are rapidly gaining favour not only on account of their sound construction, but because of the ease of installation. Labour costs for fitting are reduced to a minimum, since every tube is of the same standard construction, and the caps are fitted with knockouts, which can be removed if

Four of the latest cookers: The English Electric "HC212" model with "Ritemp" automatic oven control, the Belling revised "43," the Tricity "777," and the Siemens "H340"

"bank" assembly is desired. The terminals are of substantial construction, and are provided with separate connections for busbar connector and incoming main cable. To allow for looping, the main cable connections are of sufficient size to accommodate a pair of 7/0.029 conductors. The busbar connector is of unit design, moulded in bakelite, with ample insulation between poles, and is fitted before wiring up to the supply. The fixing brackets, which are available in single, two-, three- and four-way models, are suitable for wall or floor mounting, the feet being reversible as illustrated.

Simplex Electric Co., Ltd.

The full range of the latest type of "Creda" cookers is shown, all fitted with "Credastat" automatic oven heat control, of which "Mark 11" is the latest development. The newest cookers are so designed that they can be easily converted to "Credastat" automatic oven control if desired. The standard oven has a three-piece interior, which is instantly removable for cleaning or maintenance. High-speed boiling plates of



Simplex rectangular water heater

all popular types are available. Samples of automatic storage electric water heaters (illus.) and immersion heaters, wash boilers and cooker control switches are also shown. The stand is lighted by Simplex industrial lighting fittings.

Stokes Appliances, Ltd.

A new line of electric table standards in various colours (illustrated on this page) is shown for the first time, and there is also a new warming plate measuring 18 in. by 10 in. The company's well-known table cooker can now be supplied with a special heat-proof glass dish, to allow cooking for several people at a time and also to enable the actual cooking to be seen.

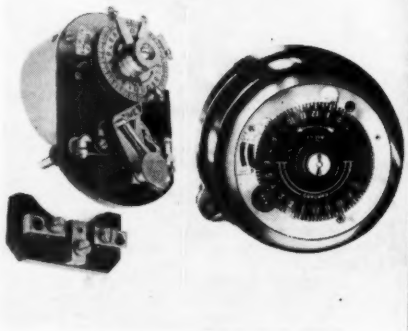
Thermovent (1936), Ltd.

Representative examples of electric convection heating units, such as have been installed in the *Queen Mary*, form this exhibit.

Bertram Thomas

The company's electric buffet is a dinner wagon with a hot plate top and

Venner "MTPX" and British Sangamo "SS" time switches and the Reyrolle "Earthometer"



an electrically-heated cupboard, and is supplied in a wide choice of woods and finishes. The hot cupboard and hot plate top are both supplied as separate units. The semi-nesting construction of a patent plate warmer (which is available for 12, 24 or 35 plates) allows small overall dimensions and permits any plate to be withdrawn without disturbing the rest.

Owing to their unusual design, the "Tunnel" skirting heaters are claimed to have a particularly rapid heating effect. Instead of a bank of tubes, a single sheet steel casing is employed. The "Tunnel" motor car heater is designed to stand on the garage floor under the engine.

In the "Bi-Heat Duplex" heater portable low temperature electric heater a combination of radiation and convection provides a uniform heat without scorching nearby objects.

Tricity Cookers, Ltd.

In view of the limited space available, this display deals exclusively with the "Model 777" cooker (illus. p. 851) and its many alternative hob fittings, coloured enamel finishes and automatic oven control.

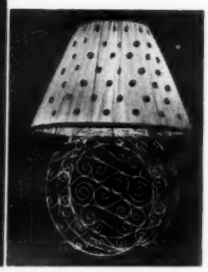
Unity Heating, Ltd.

A new hot-water circulator, water heaters of original design, a window-sill heater and developments in convectors (illus. below) claim first attention on this stand, other items being tubular heaters, skirting panel heaters of various types, flood heat radiators, low-temperature panel radiators, the "Unity Sunglow" combined heater and lighting fitting, and small domestic appliances such as towel airers.

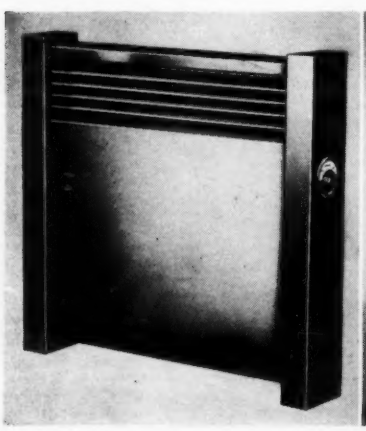
Venner Time Switches, Ltd.

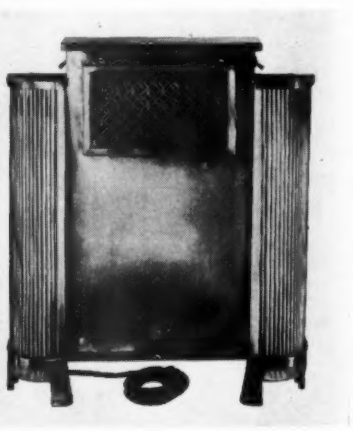
A complete working model street demonstrates the company's pilot relay control system, which, while originally developed for emergency control of street lighting under special conditions such as fog or air raids, has interesting possibilities for the control of off-peak loads. The control current is on only for a few seconds at each operation and several switching operations per day can be arranged. Once a switching operation has been started at the master control, either by hand or by time switch, all the relays must have responded, done their correct operation and stopped before another switching operation can be started by the master control.

In addition to a range of prepayment and other registering devices, time switches include a new specially small synchronous motor type "MTPX" (illus. above) designed to fit into the space previously occupied by one of the company's 15-day hand-wound types and therefore of particular interest in cases where it is desired to modernise an existing time switch system by the installation of synchronous motors with solar dials.



The Harcourt "Heatlite" floor standard and a Stokes Appliances' table standard





A Unity convector, Berry's Electric "Chinese Chippendale Magicoal" fire and a new Bulpitt convector

Electric Vehicles

Display of types particularly for municipal service with batteries and charging equipment

AS in previous years, the Electric Vehicle Committee of Great Britain has arranged a display of electric vehicles and auxiliary apparatus as a part of the Convention exhibition. The show includes the products of vehicle makers and examples of batteries, charging apparatus, &c. Although there are not quite so many as at last year's display the exhibits give a good idea of the types of vehicle and equipment which are available, and it should encourage the greater use of "electrics" by municipal supply authorities.

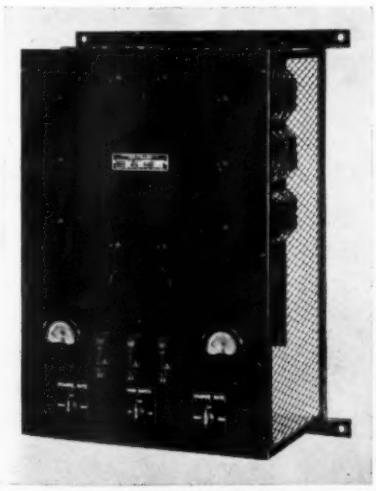
An outstanding feature of the vehicle cells which are shown by Britannia Batteries, Ltd., in both the lead-acid and nickel-iron-alkaline types, is the tubular construction of the positive plates, which gives great mechanical strength and resistance to the stresses imposed in heavy traction service. In the lead-acid battery the tubular construction of the positive plates results in freedom from buckling and internal circuits and reduced shedding of the active material. The negative plates have a "rippled" surface, providing freer and better acid circulation. The alkaline-steel accumulator is the most suitable alkaline type for electric vehicles, as it will withstand the severest operating conditions and the roughest usage, is not damaged by the heaviest discharges or by overcharging, can be charged at high rates, and has a long life.

D.P. "Kathanode" cell cut away to show construction

"Kathanode" cells (D.P. Battery Co., Ltd.) as used on different types of electric vehicles include a sectional cell demonstrating the substantial construction of the plates and the patented separators with which the cells are fitted. Photographs show the various makes and types of electric vehicles fitted with "Kathanode" batteries.

"Metrovick-Electric" battery vehicles with special bodies of interest to municipalities are demonstrated outside the exhibition.

In addition to a standard 10-12-cwt. chassis showing the full equipment of the vehicle, A. E. Morrison & Sons, Ltd., are exhibiting a similar coach-built van specially designed for milk delivery and one of an order of thirty in production for the Scottish Dairy Farmers' Co., Glasgow.



Westinghouse 2-circuit charger for electric hand barrows

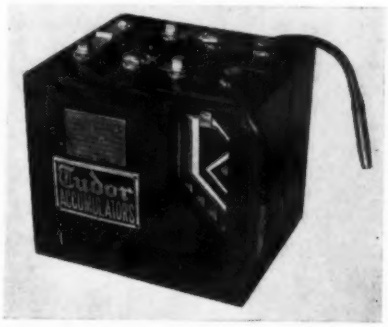
Oldham & Son, Ltd., are showing traction batteries in moulded ebonite containers. They are specially designed to withstand the most arduous conditions and the active material, "Activite," possesses remarkable resistance to chemical action and consequent disintegration. The "ML" type is intended particularly for use on trucks on which the battery compartments are slung beneath a low loading platform.

In addition to a Wilson electric tower wagon of the type illustrated, Partridge, Wilson & Co., Ltd., are showing a small speedy model "C.X.W." with a streamlined body, which is most popular with the electricity undertakings for rapid light maintenance work or prepayment meter collection. A large series chassis and a long range series "L.W." machine with standard van body are available for demonstrations. A specially designed tableau mounted on an electric vehicle and entitled "Things to Come," represents the "space gun" seen in H. G. Wells's successful film.

Wilson-Electric 2-ton chassis with twin rear wheels, fitted with Rawlinson counterbalanced tower body

Type KyD.13 cell (Tudor Accumulator Co., Ltd.) has been specially designed for the propulsion of electric vehicles; the capacity of the cell exhibited is 193 Ah at the 5-hour rate. Cut away cells shown construction.

Due to space limitations the exhibit of the Westinghouse Brake & Signal Co., Ltd., is confined to one small battery charger for electric vehicles, together with a few photographs of typical installations. The demonstration Morrison and Metropolitan-Vickers vehicles employ Westinghouse chargers and visitors can inspect the chargers under actual working conditions.



Four Tudor "KyD13" traction cells cut away to show construction

The Young Accumulator Co. (1929), Ltd., is exhibiting batteries and sectional arrangements. These include the Young battery for electric traction, which is used largely by municipal and other bodies.

Another stand on which vehicle battery equipment is shown is that of the Chloride Electrical Storage Co., Ltd.

The Corn Exchange, Brighton, in which the exhibition is to be held [*Elec. Rev. photo.*

The Lighting of Side Streets.

By H. Lingard, A.M.I.E.E.

Urgent need for improvement

IN these columns there is no need to call attention to the phenomenal improvement which has taken place in street lighting during the past two or three years, in consequence of which many of our highways are as useful by night as by day. Two main factors have contributed to this acceleration of street-lighting progress: (a) The realisation by the public that good street lighting prevents accidents, and (b) the introduction of the electric discharge lamp. There is little cause to doubt that this rate of progress will be maintained or exceeded in the future, especially in view of the active work and sound recommendations of the Ministry of Transport. The cost of new installations may or may not be greater, but the fact emerges that, taking an unbiased view, better street lighting is a national asset.

So much for the lighting of main streets, highways, and through roads. When we come to consider side-street lighting, however, we find that it has not received a similar stimulus. Indeed, a casual survey will reveal a deplorable state of affairs. In the worst streets, which appear to be in the majority, illumination values at the test point of less than 1/100th of a foot-candle are found, while low mounting heights and wide spacings are the rule rather than the exception.

Mr. H. Lingard is deputy manager of the E.L.M.A. Lighting Service Bureau, London

This type of installation has often been appropriately named "beacon" lighting, since, with the widely spaced points of light characteristic of this kind of lighting, the traveller must steer his course in gloom from one bright spot to the next. A few years ago it became the fashion to fit lanterns in side streets with highly directional reflectors. These, of course, boosted the illumination at the test point, but the "beacons" then became exceedingly glaring, and this disability in a large measure offset the advantages of a higher average illumination.

A survey for the year 1935-36 revealed that in Great Britain there were 29,015 miles of Class 1 roads, 16,855 miles of Class 2 roads, and 134,233 miles of unclassified roads. Now, remember that long stretches on Class 1 roads between towns are unlighted and that a large portion of the unclassified roads will probably be Class 2 roads, it seems fair to assume that there are at least as many miles of side streets to be lighted as there are main roads. As pointed out earlier, machinery has already been put in operation which will ensure good lighting on most of the main roads. It therefore seems that the time is now opportune to stimulate better lighting in side streets.

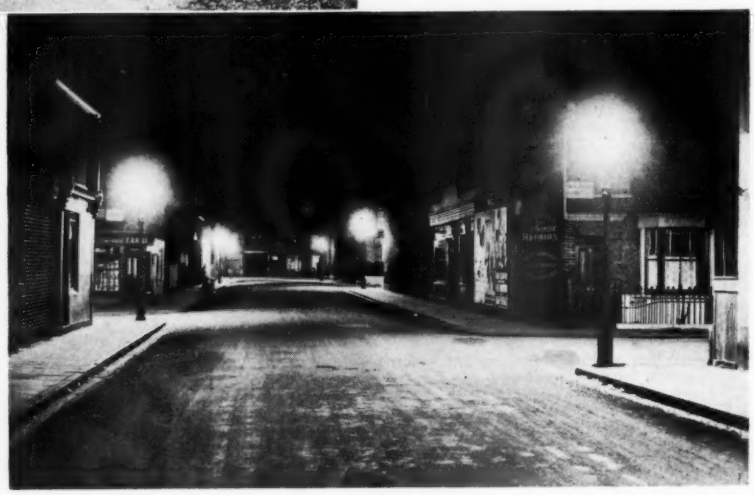
The arguments for good lighting in side streets are not perhaps as spectacular as those for the better lighting of main roads, but they are more than sufficient to justify the improvement of the majority of installations. Good lighting in side streets provides protection and comfort; that is, protection for property against burglary, and comfort in transit and arrival for the householder and visitor alike. Incidentally, it is by the side-street lighting that the ratepayer is likely to judge whether the lighting rate is being wisely spent. It is in his own road that he notices the tangible evidence of effective or ineffective expenditure.

It is worthy of note that in a number of new building estates the estate itself has done everything possible to ensure that the new houses shall be set off by high-grade electric street lighting. Surely if private enterprise sets so high a prestige value on good street lighting it is time that municipalities followed their example. The mention of municipal authorities brings to mind the stumbling block to better street lighting, namely, increased cost. But is this difficulty really as great as some would have us believe? Usually, the amount of money spent out of the local rates on street lighting is 4d. or 5d. in the pound. In other words, a mere 2 per cent. of the local rates is spent on public lighting; even the most critical Ratepayers' Association could scarcely find in these figures grounds for a charge of extravagant expenditure on this most important public service. It is indeed time that such a service had a fairer share.

At first sight it would appear that the only way to improve side-street lighting is to increase the local lighting rate, and it is undeniable that this course might be pursued with advantage in many localities. There is, however, another possible remedy, namely, the use of the smaller sizes of electric discharge lamps. Thanks to the untiring research of the leading lamp manufacturers, the electric discharge lamp, at first available only in large sizes suitable for main streets, has within the last few months been marketed in quite small sizes which are eminently suitable for side-street lighting. The first mercury-vapour lamp was the 400-W size, and step by step the 250-, 150- and 125- and 80-W sizes came along. In a similar manner the 150-W sodium lamp first appeared, followed by the 100-, 65-, and 50-W lamps. These light sources are from three to five times as efficient as the corresponding tungsten-filament lamps, and while their initial cost may be higher, their high efficiency and somewhat longer life will probably provide much better street lighting at little or no extra cost.

Typical examples of good side-street lighting at Bishop's Stortford

It is not possible to say with any degree of authority to what extent these new lamps will revolutionise side-street lighting, for the simple reason that insufficient time has elapsed since their introduction for large scale developments to occur. There is little doubt that for some



years the tungsten-filament lamp will continue to find a place in side-street lighting, but the die is to all appearances definitely loaded in favour of the new light source, especially in the more important side streets, which in urban areas are bearing an increasingly heavy burden of by-pass and loop-way traffic.

It must not be imagined that all that is necessary is the replacement of existing lamps by discharge lamps in side streets. No illuminating engineer would put lamps which are equivalent in light output to 200- or 300-W tungsten lamps on 12- or 13-ft. poles and call that good street lighting. It is essential that the lanterns should be mounted high enough to avoid glare, and in many cases it would probably be necessary to lengthen the poles by 5 or 6 ft. The extra height would reduce the spacing-mounting height ratio, and this, combined with the extra light, would automatically put the street lighting installation in a higher class of the British Standard Specification for street lighting.

A technical point very much in favour of a low spacing-mounting height ratio for side-street lighting is the less specular nature of the road surfaces encountered. Main streets, with their heavy, almost continuous traffic, tend to develop a highly polished surface, even when dry, and hence the evolution of the present technique relating to the creation of high surface brightness on the shiny surface from light thrown at glancing angles to the road. Side streets with their more matt surfaces respond less to this technique and are likely to react most effectively to a less directional lighting treatment secured by high and closely spaced posts.

No article on electric street lighting would be really complete without reference to the activities of our gas friends. Faced with the loss of hundreds of miles of main street lighting, as the discharge lamp continues to sweep the board, they are making every endeavour to consolidate their position in the side streets which have always been something of a stronghold.

Poles are being lengthened, so-called directional devices fitted and up-to-date lanterns are replacing those of Victorian vintage. It is unlikely that the gas industry can look with equanimity on the small discharge lamp with its great potentialities for side-street lighting, but we know from past experience that our rivals will put up a splendid fight. As a guide to meeting this competition it may be useful to bear in mind the following points which summarise a wide experience in blazing the trail to better street lighting:—

(a) Ascertain that the amount of light (total lumens) in both cases is similar, and do not be misled by the word "candlepower."

(b) Pay particular attention to maintenance costs. Tests will show that the maintenance of a gas installation will be much greater than the cost of keeping up a similar electric one.

(c) Capitalise the better control possible with electric lighting. By careful planning the cost of inspecting, cleaning, and automatic switching can be as low as one quarter the cost of inspection, cleaning, and manual switching. Remember, it is not possible to employ completely automatic switching with a gas installation.

Domestic Water Heating. By F. Newey, M.I.E.E.

Experience at Lincoln

DOMESTIC water heating, particularly in smaller property, has opened up a wide field for the extended use of electrical energy. For many years water heating by electrically heated storage tanks was considered a luxury, but with the introduction of efficient 1½-gal. water heaters, fitted with reliable thermostats and elements, this business has been rapidly developed by the more progressive undertakings.

As an example of methods that have been adopted to encourage the building up of this load, the Lincoln Corporation undertaking, following the introduction of an equated rate some three years ago, decided that consumers having an assisted-wiring installation should be able to obtain electricity at an all-in price of 1½d. per kWh, including either a cooker or a 1½-gal. water heater and the lighting installation. The consumer undertakes to use a minimum of 180 kWh per quarter, equal to 1s. 9d. per week, and this scheme has been very successful.

Mr. F. Newey is engineer and manager of the Lincoln Corporation Electricity Department

Approximately 1,500 water heaters of this capacity have been installed in connection with this scheme and there have been very few returns. The average consumption by this type of consumer is 850 kWh per annum, which indicates that the business is worth while. In addition to the heaters supplied on the equated rate, many heaters have also been installed at a rental of 2s. 6d. per quarter. The maintenance of the apparatus is negligible, other than replacement of washers on the cold-water inlet tap. The thermostats now fitted to modern water heaters are quite reliable.

The installation of a 1½-gal. water heater over the sink provides hot water for culinary and other domestic purposes, and where the householder is employed on shift work it is particularly advantageous to have a substantial quantity of hot water always available. The storage-type heater has a high diversity factor, but to ensure that the demand shall not be unduly high the loading is restricted to 500 W. The recovery period is slightly longer than with higher-loaded apparatus, but there has been no adverse criticism of this.

A heater which is now being favourably received is the 12-gal. "quick-service" type. This can readily be installed in what is known locally as a "cold-water bathroom." Many of the older houses in this area have a bath fitted to which only cold water is supplied; in such cases hot water is provided by an ordinary wash-boiler and carried in a utensil. In such circumstances the quick-service type provides for the demands of the occupier at relatively little expense and meets the need where the higher cost of a large-capacity storage-type heater would be prohibitive. The work of carrying water upstairs, and the risk involved, provides a good talking point for canvassers in connection with this apparatus. The heaters are hired at 7s. 6d. per quarter, including free wiring up to 30 ft., the plumbing charges being payable by the hirer.

In addition to the foregoing methods of providing domestic hot water, the demand for circulators is rapidly increasing. These heaters are fitted to existing hot-water systems by insertion in the hot cylinder and are fitted with thermostats and also local control switches. It has been found in practice that consumers prefer to have facilities for switching off the heater when the domestic boiler is in use and also at week-ends and other periods when continuous hot water up to the capacity of the cylinder is not required. The use of a thermostat ensures automatic cut-off should the house be vacated after the heater has been switched on, and the extra cost is relatively small having regard to the service provided.

From numerous tests taken it has been found that the efficiency of the circulator is very little impaired by the omission of the outer sheath, and all circulators are now fixed in this way. No scaling difficulties have occurred as the local water supply is relatively soft, and dismantling for cleaning purposes is unnecessary.

It has not been found desirable to lag cylinders as they are usually fixed in airing cupboards and are thus surrounded by relatively still air; it is important, however, to set the thermostat as low as possible consistent with adequate supplies of hot water. From experience it has been found that a setting of 160 deg. F. is generally satisfactory and prevents undue radiation losses taking place.

The energy consumption of a number of circulators in this area averages 2,300 kWh per annum. There is a wide diversity in consequence of the different habits of the consumers and the number of persons in the dwelling.

I think that sufficient has been said to indicate that the domestic hot-water business is worth developing as it provides a useful service to the consumer and is remunerative to the supply authority.

Consulting Engineers

The annual report of the Association of Consulting Engineers for the year ended April, 1937, records the deaths of five members; twelve resigned, some having retired from practice and others being no longer eligible; nine new members were elected, making the net total 127. A branch of the Association has been formed in Scotland. It is stated in the report that during the past year a record number of inquiries was received by the Association for the services of consulting engineers.

Electric Catering. By A. A. Allan

The possibilities of large-scale cooking

THE success of cooking by electricity has been confirmed by the large development which has taken place during recent years in its use for household purposes. This success has not been achieved solely because of the admitted superiority of the palatable qualities of the food cooked by electricity and its other advantages, but also because of the economical aspect, which is the deciding factor, especially from the point of view of that most important of consumers, the small householder.

Establishing the electric cooker in the home has involved intensive development campaigns following the adoption of suitable tariffs, and, of the most important factors which have influenced the development, the following are enumerated: Press publicity, facilities for easy hire of cookers, canvassing by the staffs of supply undertakings, public cooking demonstrations, the personal touch, consisting of private instruction and advice in the homes of the consumers by staffs of efficient lady demonstrators, and after-sales service. In addition, showrooms have been equipped with cookery demonstration rooms and different models of cookers available for use in the home have been exhibited—all schemes which help to build up the sale of units. Furthermore, the appeal of the vitreous enamelled cooker with its obvious advantages over earlier finishes has played a large part in placing the electric cooker in the home.

However, the potential market for the installation of domestic cookers is still of very large proportions and the continuance of the development will occupy the staffs whose duty it is to push this load for some considerable time to come.

Bearing the above points in mind, let us turn to an equally important application of electricity for cooking—that of the commercial kitchen.

Twelve months have elapsed since the case for commercial cooking, under the title of "Large Scale Electric Cooking," was so ably put forward by Messrs. Hurry and Swale at the I.M.E.A. Convention. The information provided in the paper must surely have given cause for deep consideration to supply undertakings throughout the country in view of the proof given of the high value of the load and the fact that the average price obtained is a profitable one.

From the tabulated figures given in this paper for electric kitchens in all categories, the average of connected loads and load factors were approximately 120 kW and 60 per cent. If only one electric kitchen having a connected load of 120 kW had been put into commission during the past twelve months by each of 500 undertakings, the result, based on the averages mentioned, would have reached the annual output of some selected stations, *viz.*: Total connected load, 60,000 kW; maximum demand, 35,000 kW; and kWh sold, 54 million.

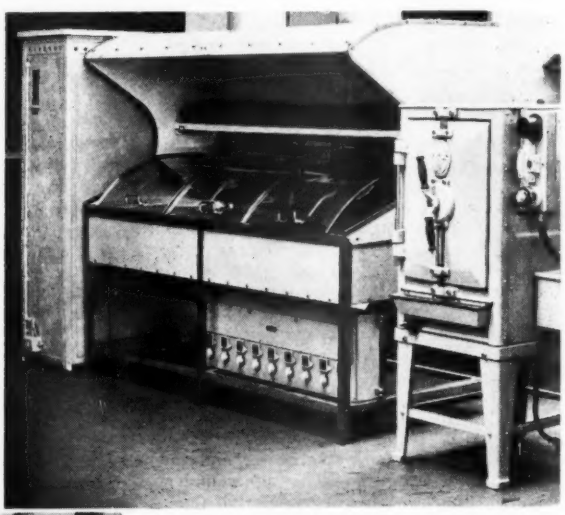
One development which took place recently was the inclusion in the 1937 Sales Management Conference, organised by the British Electrical Development Association, of a paper entitled "Selling Commercial Electric Cooking." In this paper Mr. E. M. Ackery estimated the potential load for commercial cooking in the United Kingdom at 1,000,000 kW, of which probably only about 4 per cent. has already been connected. Other estimates of possible annual consumptions were as follows: Hospitals and other public institutions with steam electric kitchens, 112 million kWh; commercial electric catering for a proportion of the taxpaying population consuming one meal per day away from home, 200 million kWh; bread baking, 900 million kWh. These figures may at first appear fantastic. It must be remembered, however, that they have been calculated on facts from statistics of actual installations.

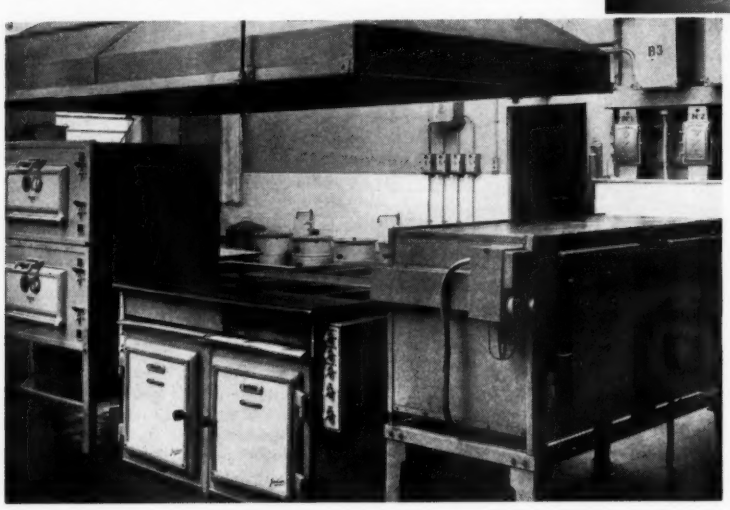
Let us revert now to the methods adopted for the sale of domestic cooking units and see how far these methods can apply to the present subject.

[*Elec. Rev. photo.*

Mr. Allan is industrial heating assistant in the Sales Dept. of the West Ham Corporation Electricity Dept.

The appeal to the domestic consumer through the lay Press has been dealt with almost entirely by the supply undertakings who know the needs of and the most suitable methods of approach to the consumers in their own areas. Manufacturers' publicity has largely been confined to advertising their goods in the electrical Press. In effect, the expenditure on publicity purposes resulting in mutual benefits to the manufacturer and the supply undertaking has mainly been borne by the latter.





[*Elec. Rev. photos.*

Two views of the kitchens at the Silvertown works of Messrs. John Knight, Ltd.

Publicity on the subject of commercial cooking can, however, be undertaken more on a national scale, and the co-operation of all manufacturers of heavy-duty cooking apparatus with E.D.A. should result in the production of satisfactory methods of approaching the prospective consumers in Press publications of interest to the catering trades. Local publicity by the supply undertakings could probably be confined to the distribution of such publications as "Electric Catering," a useful brochure which is published by E.D.A.

The provision of facilities for hire might at first sight appear to be more difficult for heavy-duty apparatus than for the domestic cooker, but it is not impracticable. There are, in fact, undertakings in the country which have been hiring out heavy-duty apparatus for some considerable time, and the schemes have proved entirely successful.

Proofs exist to show that the cost of maintenance of heavy-duty equipment is almost a negligible item so that, on this score, there is no reason for rejecting the idea of hiring the apparatus. It would, however, be of great assistance to supply undertakings if there were interchangeability of the various electrical components of cooking ranges and ovens provided by the different manufacturers.

The initial cost of the equipment for even a small kitchen catering for, say, fifty persons, is an appreciable item, and to put the figure before a prospective customer is liable to terminate the negotiations. A proposal which includes a rental charge for the apparatus (including wiring), and all maintenance would, however, more than likely meet with success. To ensure a successful development the supply industry must, therefore, give consideration to the hire of heavy duty apparatus.

Canvassing on the lines of domestic development is unlikely to prove successful. The sale of electricity for commercial cooking (a better term would probably be "catering") must be left to a specialist whose duty it is to concentrate on this one application. In view of the potential load his services should be fully occupied for many years to come. The expense of an assistant solely occupied on a specialised subject cannot be borne by many of the undertakings throughout the country as the field for development is somewhat restricted in the smaller areas of supply. In view of the likelihood of amalgamations of undertakings following the McGowan Committee's proposals, the opportunity should arise for the appointment of specialists. These specialists, having wider areas to cover, would then be in a position to adopt means of standardisation of equipment, wherever possible, with resultant benefits to the supply authority and the consumer.

Before any kind of satisfactory demonstrations can be arranged by any supply undertaking, it must have the services of a demonstrator versed in catering for large numbers of persons. Here is where the Electrical Association for Women can lend a hand by instituting courses of instruction on the subject as distinct from domestic cooking.

In this connection it would be advisable for the demonstrators to be trained in the operation of both electrically heated and steam-heated apparatus as, in the case of large public institutions, the combination of these two forms of heating usually results in the most economical operation. (There are, of course, many instances in which steam for cooking purposes is provided by means of an electric boiler.)

The provision of a fully equipped commercial kitchen which is in daily operation, serving such purposes as staff catering, and to which prospective customers can be invited, is an essential item in aiding the sale of such equipment. Here, again, the expense of equipping and operating such a kitchen is impracticable for many authorities due to various reasons. Co-operation between local undertakings to provide one such kitchen for their mutual use appears to be the solution as regards demonstrations and exhibitions.

A travelling exhibit, on the lines of those which have been adopted by several manufacturers to make supply engineers acquainted with the latest developments in switchgear, would serve a useful purpose in bringing the application of commercial cooking to the notice of all classes of caterers. This is a scheme which the manufacturers, co-operating with E.D.A., could successfully organise. A travelling restaurant has been put on the road in California by the Southern California Edison Company, Ltd., with a view to converting restaurateurs to electrical methods of catering. It should not be impossible for similar methods of publicity to be adopted in this country.

In the present early stages of selling electricity for commercial cooking the need for keeping accurate records of electricity consumed cannot be too strongly stressed, and the cost of installing a few additional meters for this purpose will be well worth while. The lack of accurate data in negotiating for commercial cooking business may quite easily result in the loss of a good load. This applies particularly in the case of large kitchens controlled by public authorities, in which instances the competition with the gas industry is very severe.

Finally, do not let us forget our best publicity agents—the domestic consumers now using electricity for cooking purposes. Let us impress on these consumers to be as particular when dining out as when they are at home and to obtain that same desirable perfection in the food they consume by dining at the electric restaurant. The slogan of the future might well be "Patronise the Electric Restaurant."

[*Elec. Rev.* photo.

Institution cooking installations. Left: The Langdon Hill Children's Sanatorium. Right: Dagenham Sanatorium

Post Office Research

THE Assistant Postmaster-General, Sir Walter Womersley, accompanied by distinguished guests representing other Government Departments, technical institutions, research and scientific organisations and representatives of overseas postal, telephone and telegraph services, paid a visit of inspection to the P.O. Research Station at Dollis Hill on May 26th.

Sir Walter pointed out that the Post Office Engineering Department was responsible for the design, installation and maintenance of telephone, telegraph and radio plant to a total value of the order of £140,000,000. The speaking clock, controlled by photo-electric cells, which was designed and constructed at Dollis Hill and installed in London last summer, was earning revenue for the telephone service at a rate sufficient to pay for half the upkeep of the research station. Other clocks were now under construction in the research workshops and would be used to extend the London time service to the provinces. Another machine constructed at Dollis Hill and first used at Folkestone announced verbally when a desired number was "engaged," thus replacing the tone signals which sometimes caused confusion to subscribers. Special telephones had been designed for subscribers with very weak voices and for those who were partially deaf.

Much original work had been done at Dollis Hill in connection with voice-operated devices and the superposing on a pair of wires already carrying a normal conversation, high-frequency "carriers" as the means of transmitting additional conversations or telegraph messages.

The telegraph service had also had its due share of research. A resulting development in the near future would be the application of telephone switching methods to telegraph circuits to increase the speed of retransmission of telegrams at intermediate centres. Very rapid advances in telecommunications necessitated considerable attention being given to the training of the staff of the Engineering Department. A completely equipped school at Dollis Hill enabled workmen to be given instruction in the apparatus which they had to maintain and the higher staff to be made familiar with recent developments; 170 courses attended by 4,584 students were held in this school last year.

The Research Branch carried out some 500 investigations per annum; 52 of the more important investigations completed during the past few years resulted in a gain, either in the form of new sources of revenue or economies, of over £800,000 per annum.

The "Sharborn" Relay

THE "Sharborn" relay might more properly be described as an electrically operated semi-rotary switch. Its outstanding feature is that the operating coils, except during the moment of actuation, are "dead" at all times. In other words, when the operating circuit is closed by some form of two-way switch the relay functions, closing the main switch, opening the operating circuit, and closing a second operating circuit which is used for actuating the relay in order to open the main switch, and completed by reversing the two-way switch. As a two-way switch, this operating medium serves only to make the operating circuit, the break occurring in the relay itself.

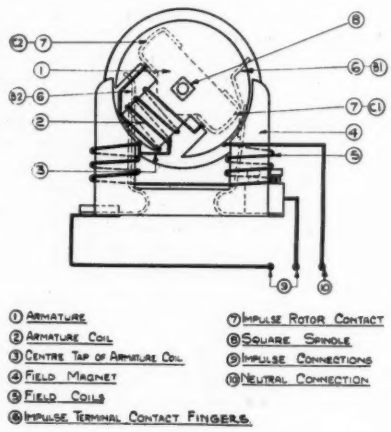


Fig. 1

W. T. Henley's Telegraph Works Co., Ltd., have acquired the world manufacturing and selling rights of this oscillating switch, the electro-magnetic portion of which is, in effect, a series reversing motor which moves through an angle of 90 deg. The electro-magnetic operating device consists of an armature and field system, the winding of the latter being taken from a centre tapping on the armature coil, so that current may flow through the armature winding alternatively from opposite ends. The current is fed into the armature winding (2) through contact fingers (B1) or (B2) pressing on the two rotor contacts (C1) or (C2), only one of which makes contact with a finger when the armature is at rest, so that only one half of the armature winding is in circuit at any particular time.

When both the armature and field system are energised the windings are so arranged that while the magnetic polarity of the field system is always the same, the magnetic polarity of the armature system is reversed, causing the rotor to turn through an angle of 90 deg. During this movement the rotor ceases to make contact with the finger and the opposite rotor contact is brought up against the second finger, *i.e.*, the first circuit is broken and the second circuit made. Therefore, the coils of the relay are only energised momentarily while this movement is taking place. When the field circuit and armature are energised through the second circuit the same sequence of events takes place but in the opposite direction.

These controlled movements of the armature are utilised for making or breaking the contact on a drum-type switch mounted on the same spindle as the armature of the relay. Steatite mounting blocks and arc shields are provided, with self-cleaning contacts, and the whole is mounted on a bakelite baseplate provided with four fixing holes.

For operating a 230/250-V relay approximately 4 A is required. A fuse is provided in the operating circuit to protect the coils and a spare fuse mounted on one of the end plates is supplied with each relay, which can be supplied as a unit or in a cast-iron case; provision is made for sealing, earthing and weatherproofing when used with conduit adaptor chambers.

The Henley "Sharborn" relay is at present available in two types, 30-A single- and three-pole, suitable for 500 V, both models being provided with connections for the neutral conductor. The operating circuits are suitable for 200/220 or 230/250-V a.c., 50-cycle systems. Models for 60 A will be available shortly.

The simplest form may be used for the remote control of lighting, space and water heating and similar purposes, and may be controlled by a two-way switch.

With "cascade" operation (fig. 2) the load is divided into sections and so interconnected by the relay that after the first section is switched on it is possible automatically to energise the other sections. The full load is built up gradually by the introduction of a time lag between the switching operations of each section. A transformer and bi-metal strip are added to act as a thermal switch control. They are housed in a separate cast-iron case attached to the relay case.

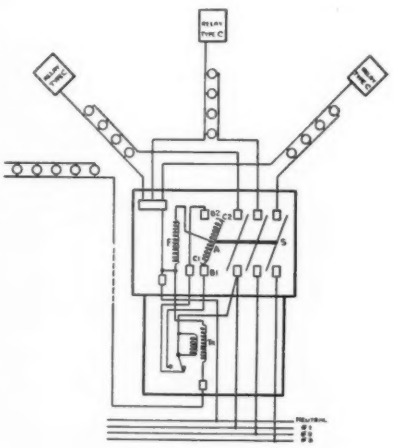


Fig. 2

The cascade type necessitates the use of a single-wire pilot between the load circuit and the relay, and may be operated by an ordinary "on" or "off" q.m. and b. switch, if it is not convenient to have two pilot wires required for the simpler type "A." A third model (type "B") is for push-button control, with one pilot wire.

Street Lighting Conference

IN organising a recent conference on street lighting the Lighting Service Bureau acted directly at the request of the I.M.E.A. Mr. N. V. Everton, chairman of the E.L.M.A. Council, presided, and the conference was opened by Sir Charles Bressey, engineer to the Greater London Highways Development Department of the Ministry of Transport.

Sir Charles recalled that a Departmental Committee of the Ministry had issued an interim report nearly two years ago, and said that its final report should not be long delayed. He attached special importance to Section 6 of the Trunk Roads Act, 1936, which gave the Ministry power to enter into, and carry into effect, arrangements for the provision on trunk roads of street lighting, where it did not exist, and for the improvement of existing street lighting, where it was inadequate.

Mr. J. N. Aldington traced the history and outlined the development of tungsten-filament and discharge lamps, the combination of these two types and the introduction of fluorescent materials in an endeavour to modify the colour of the light emitted. In addition, he said, by coating the outer bulb of a discharge lamp with a fluorescent powder it was actually possible to effect a definite increase in light output of about 6 per cent.

The discussion which followed was opened by Mr. J. W. Townley, engineer and manager, West Ham, who said that so far as street lighting was concerned, he agreed with Sir Charles Bressey that the general standard in this country was on the whole deplorably low. Though in some cases we could show the rest of the world some of the finest installations in existence, more attention must be paid to remoter districts where inefficient lighting was still contributing to the toll of accidents on roads at night.

During the discussion the question of the harmful ultra-violet rays emitted by discharge lamps was raised. In reply to this Mr. Aldington said that in ordinary circumstances there was no danger at all to the human eye from this cause, as the glass of the lamp filtered out all harmful rays. The audience were then shown a film on visibility, during which Mr. G. S. Lucas, who has been largely responsible for the production of this film, gave a running commentary. He explained that the film had been made as a result of actual observations lasting over many months on existing roads. The effects of various methods of mounting and spacing, the importance of lighting the outer part of a kerb, the need for a lamp opposite a branch road and at the apex of a fork, and the special requirements necessary for efficient illumination of cross roads and roundabouts were all shown with graphic simplicity.

After the luncheon interval, Mr. J. W. Waldram spoke on the design of electric street lighting, much of his talk being closely related to the film. Two distinct methods of defining visibility were the ability of an installation to reveal the objects upon the street and, secondly, the appearance of the lighted road. Many people assumed that these two things were the same, whereas such was not the case. Lowering the height of lamps resulted in patchiness, the darker patches of the road being built up of all the "spill" of light in the neighbourhood; therefore reduced height cut down this brightness where the road could least afford it. Too much overhang meant that

kerbs were not well defined, and if a road were more than 45 ft. wide excessive overhang would result in dark patches in the centre and by the kerb.

Central installation was to be deprecated. The result was usually a bright and uniform light down the middle of the road, leaving the sides in darkness. The kerb lines were not picked out and the junctions did not get sufficient light. On wide and double carriageways the lighting should be carried out as if there were two roads. He did not see why double ways should have to share the lighting, as wide roads seldom could be lighted really well either from the side or from the centre.

The afternoon discussion was opened by Mr. E. C. Lennox, President of the Association of Public Lighting Engineers, who thought it was time to settle where discharge lighting was most suitable and where tungsten-filament lamps could be used more effectively.

In the last session of the conference Mr. W. J. Jones, manager of the Bureau, who had just returned from a two months' tour of America, said that England was ahead in street lighting. "We may not keep the lead for long," he pointed out, "unless we insist that the standards of illumination attained on some of our main roads are made general." The Americans were likely to make a wide use of the electric discharge lamp, and although at present there were more of these lamps lighting English roads than in all the rest of the world put together, many more were needed before we reached a satisfactory standard of illumination. Mr. Jones then dealt with the comparative costs of gas and electric lighting, and was followed by Mr. J. N. Waite, chairman of the Street Lighting Committee of the British Electrical Development Association, who said his own experience in putting through sales was that involved technical matters must disappear. The engineer must put forward a concise "story" which the ordinary person could follow easily. Good street lighting could be provided by all methods, but it was extremely difficult to define what good street lighting really was. Its final criterion was the appeal it made to the average road user.

Over 200 authorities on street lighting attended the conference.

I.E.E. Council Nominations

THE nominations to fill the vacancies on the Council of the Institution of Electrical Engineers which will occur on September 30th next have now been announced.

Lt.-Col. Sir A. George Lee, O.B.E., M.C., who has been nominated for the presidency is engineer-in-chief of the General Post Office. Sir George served with the Royal Engineers in France during the war, eventually becoming Officer in Command G.H.Q. Signal Area. After the war he became interested in radio work and took a prominent part in the development of the Rugby wireless station. Following this he assisted in the development of international wireless telephony which commenced with the New York-London telephone service, and for many years was responsible for the technical direction of the telephone and telegraph service in addition to wireless work. He succeeded Colonel Sir Thomas Purves as Engineer-in-Chief in November, 1932.

[Elliott & Fry
Lt.-Col. Sir A. George Lee

Sir George has been the leader of British delegations at several international radio conferences and in 1928 he was appointed chairman of the Radio Research Board. In the following year he was elected vice-president of the Institute of Radio Engineers of America. He was chairman of the Wireless Section of the Institution for the 1927-1928 session and has been a member of the Council since 1931. He received his knighthood in the New Year's honours list in February last.

Sir Noel Ashbridge, B.Sc. (Eng.), who is chief engineer of the British Broadcasting Corporation and Mr. J. R. Beard, M.Sc., of Messrs. Merz & McLellan have been nominated as vice-presidents and Mr. W. McClelland, C.B., O.B.E., formerly director of electrical engineering to the Admiralty and now a director of W. T. Henley's Telegraph Works Co., Ltd., and other companies has been nominated as honorary treasurer.

The following gentlemen have been put forward for election as ordinary members of the Council:—*Members*: Col. A. S. Angwin, D.S.O., M.C. (Deputy Engineer-in-Chief, G.P.O.); Mr. H. J. Cash (managing director, H. J. Cash & Co., Ltd.); Mr. P. L. Riviere (engineer-in-Chief, London Associated Electricity Undertakings, Ltd.); Mr. C. D. Taite (director and chief engineer, Lancashire Electric Power Company). *Associate Members*: Dr. T. E. Allibone, D.Sc., Ph.D. (Research Department, Metropolitan-Vickers Electrical Co., Ltd.); and Mr. G. A. Whipple, M.A. (technical assistant Cambridge Instrument Co., Ltd.). *Companion*: Mr. E. Leete (director of London Electric Wire Co. and Smiths, Ltd.).

Thermal Storage Plant in London

FROM "the hole in the ground" which has been a point of interest for some time on the north side of Leicester Square is emerging a further addition to London's modern buildings. The outcome of this is an interesting block which will comprise a news reel cinema, shops, showrooms and offices. The engineering services for the building had to be divided into three separate sections, and the problem of accommodating boilers and flues for heating and ventilation was difficult. It has been overcome with considerable success by making the building all-electric and by this means obtaining the flexibility desired.

The cinema is being fitted with 150 kW of low-voltage thermal-storage plant for providing heat for the air-conditioning plant which is being designed and installed by J. Jeffreys & Co., Ltd. The shops and showrooms are being dealt with by a similar separate plant of 200-kW capacity by Rosser & Russell, Ltd. The office section, in accordance with modern development, is being fitted with air-conditioning plant designed and installed by Young, Austen & Young, Ltd., and in addition there is a system of radiator heating. The plant in this case is 600 kW low-voltage electric thermal storage. The disposition of the various units is arranged so as to give the highest possible efficiency in serving the respective sections of the building. The boiler plant in each case comprises electrode boilers, manufactured by Bastian & Allen, Ltd., and the switchgear and controls embody the latest types of thermostatic and automatic control.

The special feature of these plants is that they will be arranged so that unrestricted supply may be taken direct from the boilers, short-circuiting the storage vessels during the off-peak season—that is, from the beginning of April until the end of October. The heat will only be required for one or two hours each day during the spring and autumn months. The fact that one may switch on at a moment's notice and obtain almost instantly the heat required must be a considerable factor when deciding on the type of plant to be installed. The important point is that for seven or eight months of the year thermal-storage plants will be given a flexibility comparable with direct electric heating, and offering very considerable advantages over other forms of fuel with their attendant time lags.

We are indebted to London Associated Electricity Undertakings, Ltd., for this preliminary description of what is evidence of still further electrical development in the heating of modern buildings.

Pensions for Irish Electrical Staff

The Local Authorities (Electrical Employés) Bill has been passed by the Free State Dail. Mr. Kelly, Minister for Local Government, explaining the purpose of the Bill on the second stage, said that when the Electricity Supply Board took over the electricity undertakings of the Dublin Corporation, the Pembroke Council and the Rathmines Council persons employed in the undertakings passed into the employment of the Board. Afterwards, as the result of an agreement between the Dublin Corporation and the E.S.B., a number of employés who had been originally engaged in the electricity services of the enlarged Dublin city area, and who would otherwise have become redundant, had been transferred to the Corporation. This Bill would enable the Corporation to treat the whole service of these employés as continuous for pension purposes, whether it had been with a local authority or the E.S.B. If a superannuation allowance were granted, the E.S.B. would make a contribution proportionate to the time the employé was in the service of the Board.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

"Preserving Their Identity"

May I correct a statement in the editorial comments on page 790 of your issue of May 28th? Quoting from the McGowan Report, you say "Any attempt to carry through a scheme of reorganisation on a voluntary basis is bound to fail." You then add: "Point is given to this dictum by the recent refusal of the Newcastle-under-Lyme Town Council to participate in a voluntary amalgamation scheme, etc." May I suggest that the words "reorganisation" and "amalgamation" are not synonymous terms.

Newcastle, along with the whole of the authorities in the North-West Midlands Area, with possibly one exception, is quite willing to accept the scheme of reorganisation, the preparation of which was commenced more than six months before the issue of the McGowan Report, and which has been unanimously approved and recommended for acceptance by the engineers representing every supply authority in the North-West Midlands J.E.A. Area.

The engineers are unanimously of the opinion that the scheme referred to is a voluntary scheme of reorganisation which meets most of the criticisms levelled at the industry in the McGowan Report, and would, if adopted, be a very decided step forward, as it provides not only for uniform bulk supply charges, which is the first essential in providing uniform tariffs and conditions of supply, but also for co-ordination between the whole of the supply authorities without loss of identity by the various undertakings.

A. J. C. DE RENZI,
Borough Electrical Engineer.

Newcastle-under-Lyme, *May 29th.*

Leakage Trip Protection

The author of the above-mentioned article should not "understand" anything to be the case when making dogmatic statements in the technical Press, and his vague dismissal of my request for specific details makes it clear that he cannot substantiate his statement and answer my question.

Perhaps he will be more fortunate in the next query. After advocating and illustrating a parallel solid earth connection with a leakage trip, he goes on to say, page 653: "The earth wire from the trip coil to its electrode should be insulated as if this wire should touch other earth-connected apparatus or the other earth wire, the trip coil would be short-circuited." Is it possible to reconcile the two conditions? I, for one, should assume the second earth electrode to be "earth-connected apparatus" in the rather confused reasoning of the author.

T. C. GILBERT.

Folkestone, *May 28th.*

Rotating Vectors

The article by Mr. G. W. Stubbings puts the matter as clearly as possible in the usual method, but many people will feel that something simpler and more direct should take the place of the involved explanations of how to deal with rotating vectors. It is also the aim of mathematics to make everything as plain as possible and to eliminate mystery where this can be done. In mathematics as in engineering the simple method is to be preferred to the complicated one.

Actually a clear and mathematical method is available for dealing with these vectors, and it has also the advantage that it opens the way for future development. There is really no need to deal with the square root of minus one in a roundabout way with the statement that $j^2=-1$ and $j^4=1$, &c.

First of all we start with the axiom that we go from + to − by rotating the vector of unit length and not by travelling along the axis from right to left hand. Next we make the convention that the index denotes the amount of rotation of the vector. Thus 1^0 is in the initial position, $1^{\frac{1}{2}}$ gives the unit vector rotated through half a revolution (shortened to rev) and therefore in the −1 position. Also $\sqrt{-1}=(1^{\frac{1}{2}})^{\frac{1}{2}}=1^{\frac{1}{4}}=j$. There is no need to explain why j is a vector rotated through a right angle, as it is so by definition.

This method eliminates the unmathematical idea that the square root of a number is + or −, for we have $(1^0)^{\frac{1}{2}}=1^0=+1$ and $(1^1)^{\frac{1}{2}}=1^{\frac{1}{2}}=-1$; the two results follow from different premises and there is no ambiguity. Similarly, if one extracts the cube roots of 1^0, 1^1 and 1^2 one gets 1^0, $1^{\frac{1}{3}}$, and $1^{\frac{2}{3}}$, also no ambiguity. These roots may be converted into the cartesian form in the ordinary way.

To multiply vectors one has $A1^{\cdot 1}.B1^{\cdot 2}=AB1^{\cdot 3}$, the lengths are multiplied together and the angles added. The result is achieved by pure mathematics. Eventually it will be possible to apply mathematical developments to it when further results will follow. It enables imaginary curves to be graphed and they become as real as other curves. The hyperbola and conjugate hyperbola become joined by a circle or ellipse and cease to be discontinuous.

The following example will show the great simplification which arises from the use of the rev method. Take the formula

$$\sqrt{j}=a^{(4s+1)\pi j/4} \text{ which equals } \frac{1}{\sqrt{2}}+\frac{j}{\sqrt{2}} \text{ or } -\left(\frac{1}{\sqrt{2}}+\frac{j}{\sqrt{2}}\right)$$

I imagine that not many students see through this; they usually look at it and consider it to be an astonishing mystery. Translated into the rev method it becomes as clear as daylight.

$\sqrt{j}=(1^{\frac{1}{4}})^{\frac{1}{2}}=1^{\frac{1}{8}}$. This is a vector of unit length at an angle of one eighth of 360°=45°, and in cartesian co-ordinates it is

$$\cos 45^\circ+j \sin 45^\circ=\frac{1}{\sqrt{2}}+\frac{j}{\sqrt{2}}$$

Alternatively, $\sqrt{j}=(1^{\frac{1}{4}})^{\frac{1}{2}}=1^{\frac{1}{8}}=\cos 225^\circ+j \sin 225^\circ=$

$$-\left(\frac{1}{\sqrt{2}}+\frac{j}{\sqrt{2}}\right).$$

$\cos 45^\circ+j \sin 45^\circ$ when expanded in the well-known series $=a^{\pi j/4}$, and $\cos 225^\circ+j \sin 225^\circ$ similarly $=a^{5\pi j/4}$.

The j in the $\frac{j}{\sqrt{2}}$ indicates that this is an ordinate and is equivalent to "y" in the usual cartesian equations. The rev method of dealing with 1^n instead of with the involved mysteries which arise from the usual method is so clear and simple that it should be adopted at once.

C. TURNBULL.

Tynemouth, *May 25th.*

Checking Two-part Tariff Meters

I was interested to note in your issue of May 28th still another method of testing fixed and running charge meters, advanced by Mr. S. Hunt.

The drawback to this method, in my opinion, is the fact that indication of the individual meter switch which has opened is not obtained, the ringing of the bell merely intimating that one of a number of switches has opened. Mr. Hunt states that the meter can be found by examination of the credit and arrears pointer. I know of one particular maker who fits an indicator which certainly shows whether the switch is open or otherwise, in addition to the actual record of credit and arrears in a quantitative sense.

On the other hand, many meters are fitted only with the latter, and in these cases I venture to say from personal experience that it will be a matter of considerable difficulty if not entirely impossible to decide the position of the switch from an examination of the state of the credit and arrears pointer. This difficulty is aggravated by the fact that if the meters are at all accurate, all the pointers will be in close proximity to the zero credit position.

I have had occasion to use the combination of bell and condenser upon different occasions, in a manner similar to that suggested, for indicating purposes, and I have found that an ordinary, low-voltage bell, designed for battery or transformer operation, will serve the purpose if connected in series with a capacity of the order of 2 mfd.

I agree with Mr. Hunt that the meters will not start or run on the condenser current, but would suggest that it is not the low value of the current, but the fact that it is almost 90 deg. leading which accounts for this.

I still consider that the ideal method is a synchronous clock for each meter, and, failing this, something along the lines suggested by me a short time ago in the ELECTRICAL REVIEW, utilising neon lamps. These methods are fully automatic, both in the sense of individual indication, and continuous operation without attention, with the added advantage, that if readings cannot be taken at any particular time, the test is suspended until the test engineer can give the apparatus his attention.

J. BAILEY,
Electrical Engineer and Manager.

Barnoldswick, *May 28th.*

Transformer Standards

I was interested to note Mr. J. F. Stanley's comments published in your issue of May 28th on the above article, but I am afraid that I cannot agree that statements made in the article were either a little misleading or that they did not present that case quite fairly. With regard to the particular points discussed, I would reply as follows:—

Mr. Stanley states that "in B.S.S. No. 171 there is no refer-

ence to B.S.S. 355." On page 10 of B.S.S. No. 171-1936 the first paragraph reads as follows:—"Mining-type transformers are covered by this Specification in so far as it applies, and additional requirements for such transformers are given in B.S. Specification No. 355." Also, on page 7 of B.S.S. No. 171-1936 the following note is added:—"This Specification includes reference to the following British Standards . . . No. 355. Mining Type Transformers."

So far as temperature rise is concerned, reference was made to the American, German, Swedish, and Swiss specifications rather than to the publication of the International Electrotechnical Commission simply because these specifications are at present better known in the industry in this connection than the last named. This is an unfortuante fact, perhaps, but is in a large measure due to the lack of suitable industrial publicity given in this country to the very commendable work carried out by the I.E.C.

The point I attempted to emphasise in connection with the ambient air temperature was that in the new Specification two temperatures, *viz.*, 40 deg. C. and 35 deg. C. are referred to: the wording of the Specification is such that considerable doubt exists as to which of these values should be used when designing a transformer for a given set of overload or other conditions. The suggestion was made that an explanatory note would have assisted materially in clearing up this doubt. It is pleasing to note that considerable progress has been made in the preparation of standard rules for impulse tests, because such tests are not infrequently specified, particularly by overseas customers. S. H. HEMSLEY.

London, E.17, *May 31st.*

The Brighton "Daddy Longlegs"

In your notes on this on page 792 of the May 28th issue it was not mentioned that the weird tramway illustrated was the successor of a *far* older electric tramway invented and run by Mr. Volk on the same Brighton beach, but above tide level as the present railway is. I think I travelled on that first pioneer line about 1881, if not earlier. J. W. MEARES.

Chichester, *May 31st.*

[Our correspondent is probably referring to the present line which as mentioned in our "Obituary" notice of Mr. Volk on page 819, was the first in Great Britain and celebrated its jubilee in August, 1933.—EDS. ELEC. REV.]

Reactive VAh Measurement. By G. W. Stubbings, B.Sc., A.M.I.E.E.

A simple and accurate indirect method

REACTIVE meters fall into three classes, according to their inherent accuracy of principle. The first class comprises those meters which are accurate in all conditions of voltage and current unbalance; they must have specially designed elements with internal phase compensation. Meters in the second class are accurate with balanced voltages and unbalanced currents; their elements are of normal design and are energised by artificial voltages which usually have such values that either the voltage or the current ratings of the meter elements are non-standard. The third class of reactive meters comprises those which are accurate only when both the currents and voltages are balanced; they have normal elements of normal current and voltage ratings, and the required VARh registration is obtained by a modification of the connections of the voltage circuit.

Instruments of the third class, which may be called "balanced-load reactive meters," are so simple that their use is very attractive in circumstances such that their inherent errors are not serious. When two single-phase watthour meters are used for energy measurements the corresponding VARh is obtained approximately from the difference of the registrations of the two meters without the use of additional instruments. When a polyphase energy meter is used an approximate measure of the VARh can be obtained from a single-phase meter carrying the third line current and excited by the voltage between the two lines whose currents are carried by the energy meter.

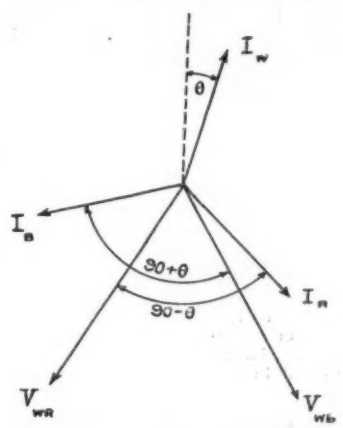
The accuracy of these balanced-load reactive metering schemes is poor if the line currents are materially unbalanced. It can be reasonably assumed, however, that the line voltages of a three-phase supply will very closely approximate to the balanced condition at all times, in which case the inherent errors of the two schemes can, in any given condition of current unbalance, bear a very simple relation to each other. Thus, a combination of three single-phase meters (two for energy and the third for VARh registration) will furnish a set of readings from which the error in VARh measurement can be eliminated, and from which a value of this quantity can be obtained that is unaffected by current unbalance and is accurate so long as the supply voltages are balanced.

Two-wattmeter Method

In the two-wattmeter method of VARh measurement, when the voltages are symmetrical but the currents of the three-phase supply are unbalanced, the system of currents can be considered as the resultant of a positive- and a negative-sequence symmetrical or balanced system. As the voltages are balanced the true VAR is carried by the positive-sequence component of the currents, and any effect the negative-sequence component has on the indication of VAR given by the meters is an inherent error.

From the vector diagram showing the effect of a negative-sequence component on the difference of the indications of two single-phase wattmeters, it can be seen that if the phase difference between the negative-sequence component in the W-line and the W-phase voltage is θ, the effect on the registrations of the B and R single-phase wattmeters is I sin θ in magnitude in each case, but that the sign of this effect is such that the blue phase meter is retarded while the red phase meter is accelerated. The effect of the negative-sequence component is thus to alter the difference of the two meter registrations by an amount 2 I sin θ. As this difference is multiplied by $\sqrt{3}$ to obtain the VARh, the inherent error due to the negative-sequence component will therefore be $2\sqrt{3}$ I sin θ.

Now consider a single-phase reactive meter energised by the current in W line and by the voltage between R and B lines. The registration of this meter will be the sum of the true VARh due to the positive-sequence component, plus the quantity I sin θ due to the negative-sequence component. As the actual registrations of this meter will require a multiplying constant of $\sqrt{3}$ to obtain VARh, the error in the registration due to the negative-sequence component will be $\sqrt{3}$ I sin θ, and this error will, when the angle θ is a lagging one, be such as to increase the registration of the motor.



Effect of a negative sequence component on the difference of the indications of two single-phase wattmeters

Conclusions

It therefore follows that, in any condition of current unbalance, the error of the single-phase reactive meter is exactly one-half of that of the two-wattmeter combination considered as a reactive meter, and, further, that when the single-phase reactive meter reads high, the value obtained from the registrations of the two energy meters will be low.

From these conclusions an indirect method of measuring VARh which is free from errors due to unbalance of line currents can readily be deduced. Let the rate of registration of the two single-phase meters used for energy measurement be respectively W_1 in the blue phase and W_2 in the red phase, and let the corresponding rate of registration of a single-phase meter carrying the white phase current and excited by red to blue voltage be W_3. Then if the error in the rate of registration of the single-phase meter be C, we shall have $\sqrt{3}\,W_3 = X+C$ where X is the true value of the VAR. As the error of the two-wattmeter VAR combination is double that of the single-phase meter and of opposite sign, $\sqrt{3}\,(W_1-W_2) = X-2C$; whence $X = (W_1-W_2+2W_3)/\sqrt{3}$.

Thus three single-phase meters suffice to give an accurate registration of both energy and VARh in a three-phase circuit, the VARh registration being independent of current balance and depending for its accuracy only upon symmetry of the line voltages.

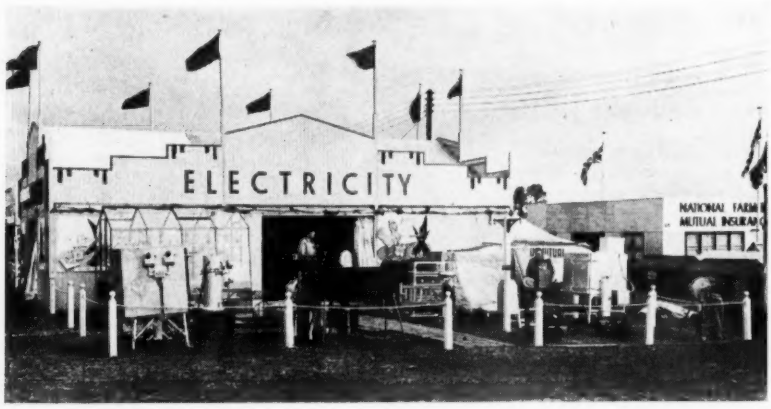
The average power factor or energy factor can be obtained accurately from the three meter registrations either by calculating tanϕ and obtaining the corresponding value of cosϕ from tables, or, if desired, directly from the meter registrations by means of a fairly symmetrical formula.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

National J.I.C. and Board

Owing to the difficulty of securing accommodation in London in May the annual meetings of the National Joint Industrial Council and the National Board were held in Birmingham, and the members of both sides of the Council and Board were entertained to luncheon by the No. 5 District (West Midlands) employers at the Chamber of Commerce Buildings. Mr. G. R. J. Parkinson the chairman of the district employers, presided at the luncheon and spoke of the value of contact between the National and District representatives. Alderman Walker, the chairman of the Council and Board for the ensuing year, thanked Mr. Parkinson for the hospitality extended to the national organisations, and emphasised their democratic nature. Each district sent its representative to the National Council and Board, which were therefore part of the district organisations. The National Council and Board had naturally to take a broader outlook on all problems, but they brought to bear the combined experience of all districts. Mr. J. Rowan the vice-chairman of the National Council, and Mr. H. J. Cox the vice-chairman of the National Board supported Alderman Walker in their thanks to the district employers.



[*Elec. Rev. photo.*

The combined electrical display organised by E.D.A. at the Bath and West Show

N.D.C. Withdrawn

As the result of representations from all parties the new Premier Mr. Neville Chamberlain, announced on Tuesday last that his proposal, as Chancellor of the Exchequer, to levy a "National Defence Contribution" upon the growth of profits during the past few years would be withdrawn. In its place a new and more equitable tax is to be devised to bring in not less than £25,000,000 a year.

The Passing of Crete Hall

Anyone who has enjoyed the hospitality of Henley's at their Gravesend Works will learn with regret of the passing of Crete Hall. Demolition work began on May 31st and before long this chalk-built house, over a century old, will no longer provide a landmark from the Thames at Northfleet. Crete Hall was built in 1818 by Jeremiah Rosher, who gave his name to the once-celebrated Rosherville Gardens and was taken over by Henley's with much of the surrounding ground when they built their Gravesend works in 1905, and from that time until 1926 it was the residence of Mr. R. O. Wright, who retired from the managership of Henley's Gravesend Works last October. From 1928 onwards part of the building provided dining accommodation for staff members and for many visitors to the works, and the remainder of the available space was latterly used for offices.

Bath and West Agricultural Show

At the Bath and West Agricultural Show held this year at Trowbridge from May 26th to 29th electrical equipment was well to the fore, and an important combined exhibit was arranged by the British Electrical Development Association. This took the form of a joint display of the important local supply authorities, including the Bath City Electricity Department; Bridgwater and District Electricity Supply Co., Ltd.; Bristol City Electricity Department; North Somerset Electric Supply Co., Ltd.; South Somerset Electricity Supply Co., Ltd.; the West Wilts Electric Light and Power Co., Ltd.; and the Wessex Electricity Company. Among the equipment shown were farm motors, electrically operated pumps, cream separators and churns, sterilising chests and electrically heated incubators, electric soil heater, and glass-house heaters. A wide range of domestic appliances was also shown including refrigerators, cold-rooms, and heating appliances. R. Alger and Sons, Ltd., Dock Street, Newport, Mon., had a display of Frigidaire refrigerating equipment which included electrically operated milk coolers, cold-rooms, a refrigerated display counter, ice-cream freezers, Frigidaire flowing cold compressors, household cabinets, and a flowing cold forced air evaporator suitable for industrial purposes, such as the air conditioning of butchers' shops and the storage of fruit and dairy products. There were a large number of lighting sets driven by petrol and Diesel engines and such sets were shown on the stands of Petters, Ltd., R. A. Lister & Co., Ltd., and Ruston and Hornsby, Ltd. Electric refrigerating plant was exhibited on the stand of J. & E. Hall, Ltd. Included in the National Mark exhibit of the Ministry of Agriculture and Fisheries, were several items demonstrating how electricity can be used in farm work and a special feature was an egg-grading machine and egg candling lamp. The latter uses a concentrated beam so that eggs can be tested in an undarkened room; a standard 60-W lamp is used. The British Oxygen Co., Ltd., showed a complete range of oxy-acetylene welding and cutting equipment and demonstrations in welding and cutting were given. Special attention was paid to the latest types of electrically operated sheep-shearing machines displayed by the Cooper-Stewart Engineering Co., and electric milking machines were shown by a number of exhibitors.

Bradford Industrial Electrical Exhibition

An exhibition of industrial electrical apparatus has been held during the current week at the showrooms of the Bradford Corporation Electricity Department, in conjunction with Philips Industrial (Philips Lamps, Ltd.). The apparatus demonstrated included welding plant and rods, high-speed welding rods, oxide-cathode rectifiers for d.c./a.c. change-overs and other purposes, condensers for power-factor correction,

Some of the stands at the I.M.E.A. Exhibition [*Elec. Rev. photos.*

"Philora" sodium and mercury electric-discharge lamps, and neon irradiators for plant development.

A Restaurant Lighting Installation

A portion of the premises of M. Robinson & Son, Ltd., has recently been reconstructed, and the catering facilities have been modernised. The old cafés have given place to a large new café with up-to-date kitchens. All heating, lighting and general services are concealed. The heating panels have been placed in the ceiling, and as structural requirements necessitated two stanchions running through the centre of the room, these were treated decoratively to form the main lighting features. G.V.D. Illuminators, Ltd., were responsible for the planning of the whole of the lighting, and the upper parts of the centre columns and "mushrooms" were specially designed to meet their requirements. As the accompanying illustration shows, the "mushrooms" are also used as containers for flowers and ferns without detracting from the lighting. Cornice lighting at the sides of the room is arranged over the doors and windows. The electrical contractors were Edgar Phillips, Ltd., of West Hartlepool.

The café of M. Robinson & Son, Ltd., Stockton-on-Tees, lighted by G.V.D. Illuminators

Recent Contracts

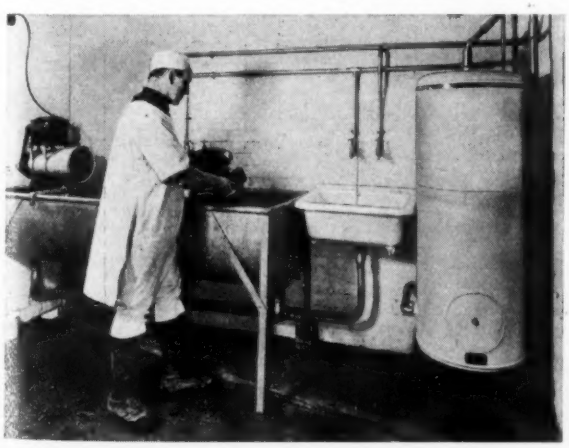
The Norwich Corporation Education Committee's new Lakenham and Catton Grove schools have been wired throughout with Edison Swan cable by Campbell & Co., Norwich. The architect was Mr. J. Nelson Meredith, and the work was carried out under the supervision of the city engineer, Mr. J. S. Bullough. "Royal Ediswan" lamps have been used exclusively for lighting these buildings.

Following the order for a Brush-Ljungstrom 15,000-kW (c.m.r.) turbo-alternator set for the Grimsby Corporation, which was received early this month, the Brush Electrical Engineering Co., Ltd., has now received, through its Australian agents (Parlow & Retallack Pty., Ltd.), a further order for a 15,000-kW (c.m.r.) set from the New South Wales Government, Railways Department, Australia. This order has been obtained in face of world-wide competition and after a full investigation by the Government Authority concerned into the merits of the various tenders.

In face of keen competition Marconi's Wireless Telegraph Co., Ltd., has secured an important contract from the Turkish Government for the installation of a long-wave high-power broadcasting transmitter, a high-power short-wave broadcasting transmitter and a Broadcasting House for Ankara. The long and short-wave transmitters will be installed in one building at Etimessut, fifteen miles from Ankara, the two points being connected by a music cable. The long-wave transmitter will operate on a wavelength of 1,639 metres with an unmodulated aerial carrier wave of 120 kW. The station is designed to cover a wave range of 1,000 to 2,000 metres, so that a change of wavelength can be made without difficulty. Modulation will be by means of the Marconi high-level "Class B" system, and the permissible distortionless modulation amounts to 90 per cent. The short-wave broadcast transmitter is to operate on a carrier energy of 20 kW. It covers a wave-band of 14 to 100 metres, and provision is made for quick change to any of two working waves. A crystal drive with two pairs of crystals for two spot wavelengths is employed. High level "Class B" modulation is also employed in this transmitter. Broadcasting House, Ankara, will comprise five main studios.

A Dairy Farm Installation

A recent electric dairy farming installation is that of Mr. W. B. Mumford, of Ley House Farm, Worth, Sussex. The dairy consists of three rooms, a separate one being provided for receiving and cooling and another for washing and sterilising utensils. The milk, after collection, passes over a "Coldair" cooler provided with dust covers to prevent contamination; the top half is arranged for pre-cooling with water and the lower half for brine cooling from the refrigerator. In conjunction with the milk cooler there is a 100 cu. ft. cold room in which milk in churns or bottles may be stored. In the adjoining washing and sterilising room there are a 20-gal. G.E.C. electric storage water heater supplying hot water for use in the milking shed and a washing-up trough which is also equipped with an electric bottle-washing machine. The G.E.C. also supplied a large self-contained electric sterilising chest with a capacity of 75 cu. ft. and a pump with a maximum output of 600 gal. per hr. which provides all the water requirements for the farm from a well and ensures that there is an ample supply for drinking, washing and the pre-cooling of milk. Recently an electric groomer has been used with very satisfactory results, this machine being employed to remove dirt or loose hairs from the cows before milking.



G.E.C. heater which provides hot water for the milking shed and the hand-basin and washing-up trough

French Electrical Imports and Exports

The French imports and exports of electrical machinery, apparatus and cognate material during 1936 are shown in the appended table with the corresponding figures for 1935. The values are given in thousands of francs, while, for purposes of comparison, the sterling value of the total converted at the current franc value of 110 to the £ has been added. It will be seen that the past year's imports show an increase of £21,140, while exports declined by £109,410.

	Imports.		Exports.	
	1935 1,000 fr.	1936 1,000 fr.	1935 1,000 fr.	1936 1,000 fr.
Dynamo-electric machines, transformers and parts ...	31,599	28,451	28,400	21,131
Telegraph, telephone and other electrical appliances	131,094	135,695	81,638	71,970
Incandescent lamps and radio valves	40,648	46,959	14,022	14,425
Arc lamps and parts	94	169	70	27
Carbons for electrical and industrial purposes ...	5,342	5,041	12,745	10,358
Electric wires and cables ...	3,873	5,950	24,847	30,310
Parts of electrical apparatus	17,301	16,824	10,242	11,700
Magnets, other than electro-magnets	576	747		
Accumulators and parts ...	1,382	1,578	11,215	9,971
Dry batteries and condensers	19,943	12,363	2,508	2,489
Porcelain and other insulators	2,238	1,638	7,177	8,447
Total fr.	254,090,000	255,415,000	192,864,000	180,828,000
At 110 fr. to £	£2,309,910	£2,331,050	£1,753,310	£1,643,900

Trade Announcements

Henry Wiggin & Co., Ltd., have made arrangements with the H. A. Wilson Co., of Newark, N.J., to handle the latter company's full range of thermostatic metals in Great Britain and the rest of Europe. In the first instance, Wiggin's supplies will be drawn from New Jersey, but in due course the complete range will be rolled at their Birmingham works.

Lighting Research announces that it has purchased the business of Firmlite Glass, Ltd., and the two businesses will in future be carried on at 30, Paternoster Square, E.C.4 (telephone: City 4629).

General Resistors, Ltd., has changed its name to Genristo, Ltd., and now occupies new works at Genristo Works, Osmaston Street, Lenton, Nottingham.

E. H. Jones (Machine Tools), Ltd., have recently transferred their Midlands showrooms and branch office to larger premises at 14, Florence Street, Birmingham. The change has been necessitated by increased business in this area, and the larger space available will enable the company to stock and demonstrate a wider range of machine tools than in the past.

The recently registered Hunts (Wholesale) Supply Co., Ltd., 26, Stodman Street, Newark-on-Trent, asks for manufacturers' lists and prices.

Old Cromptonians

Col. R. E. Crompton was in the chair at the annual dinner of the Old Cromptonian Association held at Grosvenor House, London, on May 20th. Among those supporting him were Lord Hirst of Witton, Sir James Swinburne, and Messrs. F. Parkinson, J. E. Edgecumbe, H. A. Scott-Moncrieff, J. W. Meares and E. J. Fox. In proposing the toast of "The President" Lord Hirst referred to his personal contacts with Colonel Crompton through an association of more than fifty years. Colonel Crompton replied, after which Mr. W. Meares referred to the Crompton-Parkinson Company's keen sense of responsibility to its employés as evidenced by the week's holiday with pay given to all employés, and by its superannuation and bonus schemes. At the Guiseley and Chelmsford works a five-day week had been instituted.

COOK BY ELECTRICITY
SUPPLIED FREE · INSTALLED FREE · MAINTAINED FREE · KETTLE FREE
APPLY TO THE ELECTRICITY DEPT FOR FULL DETAILS

An electric cooker display at the Erith pageant

New Lighting Fittings

Two of the lighting fittings illustrated in the composite block on page 770 in our issue of May 21st (Nos. 7 and 9) were by Novonotions, Ltd., who have only just entered the domestic fittings market. They are of anodised aluminium, No. 7 ("Mayfair") having a contrasting jet-black base with a substantial glass casting frosted on the inside. No. 9 ("Cantilever") is a lower-priced model and suitable for occasional use on a cocktail cabinet, bedside, or boudoir; in fact anywhere where it will harmonise with a modern setting.

A feature of the "Lowerlux" fitting of Troughton & Young, Ltd., which was also illustrated, is the anti-glare principle incorporated. This is brought about by fitting below the bulb rings of strip glass offering a wide area to horizontal light, but practically no obstruction to vertical light, thus enabling a bright light to be obtained underneath the lamp without glare from a distance.

Harrogate Coronation Procession

The accompanying illustration shows a decorated lorry arranged by the Harrogate Corporation Electricity Department, which took part in the local Coronation procession. The vehicle was a six-ton cable carrier on which was mounted an illuminated crown. The illuminations consisted of 600 sign-type lamps, the energy for which was supplied by a petrol-engine driven generator placed inside the crown, and was entirely independent of the tractor unit. During the week following the Coronation the lorry toured the area of supply.

Harrogate Electricity Department's display in the local Coronation procession

Submarine Cable Laying

The cable ship *Faraday* was to leave the works of Submarine Cables, Ltd., Greenwich, yesterday (Thursday) to lay two telephone cables between England and Holland. These cables are each approximately eighty nautical miles in length and are of the coaxial type, insulated with Paragutta, and they are to be operated on the carrier system.

Electricity in the Erith Pageant

On Whit-Monday a pageant was held at Erith, a feature of the procession being the Fraser & Chalmers (G.E.C.), decorated lorry which was awarded the first prize in its particular class. As our picture shows, the display drew attention to the electric cooker scheme which has recently been introduced by the Erith Council.

The Refrigeration Campaign

The first of a series of luncheons being arranged by the British Electrical Development Association throughout the country, in a campaign to foster the extended use of refrigerators, was held recently at Gravesend Town Hall, when the speaker was Dr. J. Fenton, medical officer of health of Kensington and chairman of the Central Council for Health Education. The Mayor (Councillor H. A. Hodge) presided. Dr. Fenton said that the only practical method of protecting food was by refrigeration, which had the additional advantages to the housewife of making many foods more palatable and of obviating the additional expense involved in buying in small quantities. Foodstuffs were generally delivered by the retailer in a hygienic condition, but there was a big loophole in the home where means were not provided to ensure that the food was kept in the best possible condition. Dr. Fenton was thanked by Councillor J. W. Clunn, chairman of the Electricity Committee.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. June 2nd.	Fortnight's Inc. or Dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton.	£11	—
a ,, Roll... ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£232	—
Grade II ... ... ,,	£162	—
Grade III... ... ... ,,	£88	—
c Brass (rolled metal 2" to 12" basis)... per lb.	9¼d.	½d. dec.
c ,, Tubes (solid drawn) ... ... ,,	1/0½ to 1/0¾	½d. dec.
c ,, Wire, basis ... ... ,,	9¼d.	½d. dec.
c Copper Tubes (solid drawn) ... ... ,,	1/2¼d.	½d. dec.
g ,, Bars (best selected)... ... per ton	£93	£2 dec.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£65	£1 dec.
d ,, ,, Wire Rods ... ,,	£70	£1 dec.
d ,, ,, H.C. Wire ... per lb.	10d.	½d. dec.
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/9	—
f ,, Sheet ⅛" thick & up ... ,,	1/7 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	11d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s. 0d.	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£25 15s.	15s. inc.
g Mercury ... ... per bot.	£15 12s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/3½	—
p ,, ,, drawn bars & rods ,,	1/3½	—
p ,, ,, rolled strip & sheet ,,	1/1½	½d. inc.
p ,, ,, wire ... ... ,,	1/3½	—
o Platinum ... ... per oz.	£11 5s.	—
d Silicium Bronze Wire ... ... per lb.	10½d.	½d. dec.
g Spelter ... ... per ton	£22 15s.	17/6 inc.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) .. .. per ton	£249 5s.	—
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes."

The Croydon Illuminations

In our May 21st issue we reproduced a photograph showing some of the Coronation illuminations at Croydon. "Beeantee" Illuminations, Ltd., inform us that their striplighting was used for the street decorations and electrical set pieces in this scheme.

New Catalogues and Lists

C.A.V. Bosch, Ltd., Acton, W.3.—Catalogues of driving lamps for commercial vehicles and compensated voltage control, including instructions for maintenance.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—Illustrated art catalogues of electric fans and refrigerators.

E. A. Wood, 100, Aston Road, Birmingham, 6.—A folder illustrating industrial and commercial lighting fittings.

Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W.1.—A catalogue of pressure and draught indicators and recorders.

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, London, W.C.2.—A catalogue of "Propelair" ventilating fans.

Davidson & Co., Ltd., Belfast.—An illustrated 60-page booklet dealing with pneumatic conveyance.

British Insulated Cables, Prescot.—Leaflets on mining exploders, multiple telephone cables, welding copper, copper for overhead power lines and paper insulated cables.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—A booklet called "How to use 'Kalanoid'."

Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1.—A wall chart giving recommended compositions of nickel cast-iron for specified applications.

Edison Swan Cables, Ltd., 155, Charing Cross Road, London, W.C.2.—A complete thumb-indexed catalogue of cables, bound in a stiff cover.

Archibald Low Electrics, Ltd., Newarthill, Motherwell.—A complete illustrated thumb-indexed catalogue of equipment, including water heaters, immersion heaters, tubular heaters, boilers, milk urns, &c.

General Radiological, Ltd., 204, Great Portland Street, London, W.1.—Details of a fine laminated diaphragm with focused flat grid for screening and radiography.

Wholesale Fittings Co., Ltd., 23-37, Commercial Street, London, E.1.—A 72-page catalogue of commercial and industrial lighting fittings.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Details of "Osira" 80- and 125-W electric-discharge lamps.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—A pamphlet dealing with medium-voltage electrode water heaters.

Marconiphone Co., Ltd., Tottenham Court Road, London, W.1.—A leaflet dealing with anti-static aerials.

Private Arrangement

Service (Chester), Ltd., Handbridge Road, Chester, electrical engineers, &c.—A private meeting of creditors was held recently, when the statement of affairs showed liabilities of £430. The total assets were £34, leaving a deficiency of £396. The company was registered in August, 1936. It was decided that the matter should be left in the hands of the solicitor to realise the assets to the best possible advantage.

Bankruptcy Proceedings

G. Ireland, electrical engineer, near the Oak Inn, Fambridge Road, Maldon.—Scheme sanctioned to pay in full all preferential debts, and all proper fees, costs, charges and expenses of and incident to the proceedings, and a composition of 20s. in the £ on all provable debts, with the exception of those of debtor's wife and daughter which are released under seal, and a claim of mortgagees of debtor's property who rely on their security. Receiving order discharged. Order of adjudication annulled. Composition approved. Last day for receiving proofs for dividend June 8th. Trustee, Mr. J. L. Poland, 29, Russell Square, W.C.1.

A. Hitner, 7, Linden Grove, Fallowfield, Manchester, electrical engineer and radio dealer.—The receiving order was made on a creditor's petition, and the statement of affairs which has been filed by the debtor discloses gross liabilities of £10,062. Of this amount £3,633 is expected to rank for dividend, with net assets of £477, leaving a deficiency of £3,155. The debtor attributes his failure to losses under guarantees given on behalf of a limited company. At the first meeting of creditors held recently, a resolution was passed appointing Mr. A. T. Eaves, of H. L. Price & Co., 47, Mosley Street, Manchester, as trustee.

S. List, of Tenterden Drive, Hendon, London, lately trading as a dealer in talkie apparatus at Imperial House, Regent Street, London. This debtor applied for his discharge at the London Bankruptcy Court before Mr. Registrar Parton, on May 28th. An immediate discharge was granted subject to debtor consenting to judgment for £25.

D. C. Hayes (Streetsbrook Electrical Co.), electrical contractor, 44, Burman Road, Shirley, Warwick.—Supplemental dividend of 1¾d. in the £, payable May 31st at 159, Great Charles Street, Birmingham.

C. H. F. Thick, electrical engineer, lately carrying on business in partnership with S. W. West at 1, Nun's Walk, Winchester.—Public examination June 8th at the Castle, Winchester.

R. W. Burrows (Radio Services), radio and electrical engineer, High Street, Skegness.—First meeting June 8th at 4 & 6, West Street, Boston. Public examination July 1st at the Municipal Buildings, Boston.

W. Sims, electrical engineer, 16, St. James Terrace, Buxton.—Last day for receiving proofs for dividend June 12th. Trustee, Mr. P. M. Milward, Byrom Street, Manchester, Official Receiver.

E. M. Swift, electrical engineer, 10, Joinings Bank, Langley Green, Worcester.—Public examination July 2nd at the Law Courts, West Bromwich.

G. W. Linsell, radio and electrical dealer, Tippendale Lane, Park Street, near St. Albans.—Trustee, Mr. F. E. Bendall, 4, Charterhouse Square, E.C.1, appointed May 21st.

T. S. Cooks, wireless dealer, 219, Milton Road, Portsmouth.—Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth. Official Receiver, released May 10th.

R. T. Collins, wireless dealer, 41, Market Street, Penryn.—Last day for receiving proofs for dividend June 9th. Trustee, Mr. C. Hancock, 12, Princes Street, Truro, Official Receiver.

G. Warder and **R. Warder** (Warde Richards), radio dealers, 100, George Street, Hull.—First and final dividend of 6¾d. in the £, payable May 31st at 1, Parliament Street, Hull.

W. A. Prince and **C. S. Prince** (Prince Bros.), electrical contractors, 69, Princess Street, Manchester.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, released May 6th.

F. V. Lambert, electrical contractor, 31, Harmer Street, Gravesend.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., released April 28th.

P. T. Bradley, radio engineer, 1, The Arcade, Stafford.—Last day for receiving proofs for dividend, June 11th. Trustee, Mr. R. E. Clark, 17, Albion Street, Hanley, Stoke-on-Trent.

J. Conlon, electrical engineer, 1b, Buckingham Street, Hull.—Receiving order made May 20th on debtor's own petition. First meeting June 4th at 1, Parliament Street, Hull. Public examination June 14th at the Guildhall, Hull.

Meeting of Creditors

Century Lamps (London), Ltd., 89, Upper Thames Street, London, E.C.4.—At the statutory meeting of creditors the statement of affairs showed liabilities of £1,316, of which £684 was due to the trade and the balance to cash creditors. The assets were estimated to realise £523 and were subject to preferential claims of £19 and debentures of £500. The net assets were £4, leaving a deficiency, so far as the creditors were concerned, of £1,312. The company was registered in August, 1927, with a nominal capital of £500, all of which had been issued and was fully paid up. It was formed to deal in imported electric lamps and there was every prospect of a successful business being carried on. Considerable advertising was done, but before the benefits of that could be obtained a heavy import duty was placed on foreign lamps. The result was that the early promise of the company did not materialise, and owing to the keen competition experienced the accounts only showed net profits during two years. The debenture was issued in 1936 and the holder was willing to forgo £200 of the amount due to him and also withdraw the balance of a loan account which he had against the company amounting to £400. During the discussion it was suggested that a composition of 3s. in the £ should be paid to the creditors and it was stated that that would be done. A receiver for the debenture holder was appointed on May 11th last.

Company Liquidations

Wireless Engineering Co., Ltd.—Winding up voluntarily. Liquidator, Mr. F. E. Bendall, 1, George Street, Sheffield.

Vincents (Radio & Electrical), Ltd.—Particulars of claims by June 11th to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Gill & Reigate, Ltd.—Meeting June 28th at Salisbury House, London Wall, E.C.2, to receive an account of the winding-up by the liquidator, Mr. N. E. Munns.

Rolls Radio, Ltd.—Meetings June 30th at High Holborn House, W.C.1, to receive an account of the winding-up by the liquidator, Mr. C. H. Bennett.

Domestic Supplies, Ltd.—Meeting June 22nd, at Shaw House, Fryer Street, Wolverhampton, to receive an account of the winding-up by the liquidator, Mr. H. A. T. Treble.

Dissolution of Partnership

Young & Thompson, electrical engineers, 9b, Market Hill, Luton.—Messrs. E. A. Young and C. W. Thompson have dissolved partnership. Mr. Thompson will attend to debts and carry on the business.

Parliamentary News

BY OUR SPECIAL REPORTER.

Reorganisation of Supply

IN the House of Commons on May 26th Mr. Kelly asked the Minister of Transport, whether in view of the delays consequent upon the Coronation, he would extend beyond June 1st the period for replies to the document issued to various electrical and local authority associations indicating the Government's provisional conclusions as to the reorganisation of the electricity supply industry; and whether he would consider the advisability of publishing the document.

Mr. Hore-Belisha said he was prepared to extend the period for making representations to the end of June. He did not propose to publish the document.

Coronation Floodlighting

Captain A. Evans asked the Parliamentary Secretary to the Ministry of Health, as representing the First Commissioner of Works, if he would state the approximate nightly cost of floodlighting public buildings during the Coronation period; and if he would consider the desirability of causing permanent equipment to be installed so that the spectacle could be repeated on all suitable occasions and at week-ends throughout the summer-time period.

Mr. R. S. Hudson said that through the generous action of the gas and electricity supply companies in providing the bulk of the gas and electricity free, the approximate nightly cost, excluding capital expenditure and hire charges, of floodlighting public buildings during the Coronation week was quite a nominal sum for the current and maintenance. Owing, however, to the very heavy cost which would be involved in the purchase of the equipment and in providing the wiring on a permanent basis, the First Commissioner did not consider that the installation of a permanent system could be justified at the present time.

Electricity Supply

Lighting, Domestic, Power

Adwick-le-Street.—CONCESSIONS.—The price of electricity for household consumption is to be reduced by ¼d. per kWh and for street lighting by 12½ per cent.

Amble (Northumberland).—UNDERGROUND CABLES.—The Electricity Department is to lay underground mains and services on the Westfield housing estate.

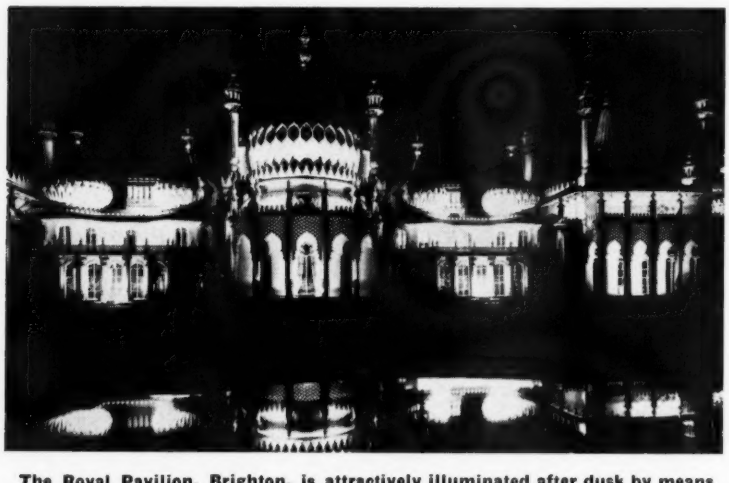
Ashton-under-Lyne.—LOAN.—The Town Council is applying for sanction to a loan of £3,600 for extra-high-voltage equipment.

Barking.—SUPPLY TO FACTORY.—In order to afford a supply of electricity to the new factory of the Invicta Foil Co., Ltd., the Electricity Committee is to build a sub-station at a cost of £1,390.

Basingstoke.—EXTENSIONS.—Application has been made by the Town Council for sanction to a loan not exceeding £1,120 for the following extensions: Old Basing, extension of existing overhead distribution mains along Park Lane and School Lane; Sherborne St. John, extension of existing overhead mains to Manor estate; Isolation Hospital, extra-high-voltage overhead line and transformer station.

Bebington.—SODIUM LIGHTING.—It is proposed to re-light Port Sunlight at a cost to the Bebington Council of £2,273, sodium lamps being employed.

Bournemouth.—STREET LIGHTING.—The Corporation Lighting Committee is experimenting in order to find the best form of lighting for intermediate and by-roads.



The Royal Pavilion, Brighton, is attractively illuminated after dusk by means of blue, green, red and amber lighting from G.E.C. floodlights and "Osira" lamps

Bradford.—NEW EQUIPMENT.—In order to carry out a scheme of reorganising the electricity supply, and to make provision for its maintenance in case of air raids should the principal switch-house be put out of commission, the Electricity Committee is to spend £120,822 on providing and equipping three 33,000-V step-down transforming stations, £14,305 on the replacement of existing and the provision of additional 6,600-V switchgear at Four Lane Ends sub-station, and £29,906 on the reorganisation of the high-voltage switchgear at the Valley Road station.

Burnley.—LOAN.—Application is being made by the Town Council for sanction to a loan of £30,000 for mains extensions and services.

INQUIRY.—The Electricity Commissioners are holding an inquiry in Burnley on June 11th into the Council's application for authority to extend its electricity supply to Habergham Eaves, Ightenhill, and Worsthorne-with-Hurstwood.

RURAL SUPPLIES INQUIRY.—An inquiry is to be held into the Corporation's application for an Order to supply electricity to Worsthorne, Habergham Eaves and Ightenhill.

Bury.—LOAN.—Application is to be made to the Electricity Commissioners for permission to borrow £10,000 for the provision of an additional high-voltage cable feeder to Heywood.

Canada.—MUNICIPAL CONTROL.—A Bill before the Quebec Legislature seeks to permit any municipal corporation to take over the control of electricity supply within its territory. County municipal councils will have similar powers. Any municipal corporation wishing to use this law must adopt a by-law to that effect in which it will specify what it is desired to do, and provide for the means of payment. This by-law will be submitted for the approval of the ratepayers and nothing more than this ballot will be required. The producers and distributors of electricity and holding companies may not vote. Under the Bill no municipal electricity service so established may be sold, ceded or leased, except to the Provincial Government, without there being a by-law approved under the same conditions as provided for the establishment of a municipal plant. In the case of a county municipality establishing a public electricity service the county council may levy upon the local municipalities for the cost in proportion to the value of the taxable property in each local municipality. A municipality will not be obliged to go to the full extent of municipalisation. It may establish a service for the generation and distribution of electricity, or a service of distribution only. For these purposes it may acquire by agreement or by expropriation within the municipality, or outside, all water powers, rapids, &c., and the enterprise and assets of any person, corporation or society exploiting a generating or a distributing system, or both. A municipality may also make contracts for the purpose of procuring electricity for its distribution services and sell electricity to other municipalities when it has a surplus.

NEW QUEBEC ELECTRICITY COMMISSION.—Another measure has as its object the creation of an organisation called the Provincial Electricity Commission, with full power to control and survey enterprises for the production and distribution of electrical energy in the province. It is to have the right to make a full investigation of their financial structure and, of its own initiative, or, on the request of an interested party, fix rates for electricity. All companies in the industry must obtain an operating permit from the commission, expiring after two years. All contracts of private companies are given a limit of five years' duration. Municipalities owning their own electrical systems are exempt, and they may avail themselves of the Commission's power to revise a contract with a seller or distributor of electricity.

Carlisle.—SUPPLY EXTENSIONS.—The City Council is to supply electricity to small holdings for the Land Settlement Association at a cost of £3,173.

Colchester.—SUPPLIES TO FACTORIES.—The Town Council is to afford supplies of electricity to a proposed new factory near Bergholt Road (M. W. Woods, Ltd.) and to new works in Cowdray Avenue (E. N. Mason & Sons, Ltd.). The estimated total cost is £2,961.

Croydon.—POWER CHARGES DECISION.—The Borough Council last week declined to grant any decrease in the charges for electricity for power purposes. In October last, following the approval of reductions in charges under the lighting, domestic and all-in business rates, and for bulk supplies to large stores, power users complained that not only were they excluded, but they had to face increased charges under the maximum demand system. They sent a representative deputation to the Council to present a memorial requesting a reduction in the charges. The Electricity Committee, in its report to the Council last week, stated that the average price per kWh for power supply, after deducting discounts, was 0.805d. Under the all-in tariffs the charge for domestic supply was 1.22d. and that for business premises, 1.6d. After giving the memorial full consideration, the Committee was unable, particularly in view of the large increase in the cost of coal, to recommend any reduction in the existing power tariffs.

Darlington.—FEEDER CABLES.—Application is being made to the Electricity Commissioners by the Town Council for permission to borrow £3,020 for new feeder cables.

POWER STATION EXTENSIONS.—Sanction has been received by the Town Council to a loan of £235,000 for the extension of the generating station.

Earby.—INQUIRY.—A Ministry of Transport inspector conducted an inquiry at Earby on May 28th into an application for sanction to an overhead electric line to Salterforth. Mr. S. R. Siviour said that the Electrical Distribution of Yorkshire, Ltd., had powers to supply Salterforth. Its proposal was for a main from Thornton-in-Craven over agricultural land through Skipton and Earby at a cost of £2,678. For a supply by underground cable £7,176 would be required, which was not considered economic. Earby Council opposed the application and suggested the use of Nelson Corporation's cable, which passes through Salterforth.

Glasgow.—SUPPLY TO EXHIBITION.—The Electricity Committee is to provide an electricity supply to the Empire Exhibition, Scotland. The scheme involves a demand of approximately 7,000 kW to be supplied at one point at 6,500 V, and that the consumption estimated by the Exhibition authorities is 7,000,000 kWh; on this basis the revenue to the Corporation would be £14,583. The Exhibition authorities desire the Corporation to provide transformers, switchgear, and cabling at ten different points necessary to reduce the voltage from 6,500 to 440/250, and they have agreed to pay the Corporation £12,500.

SWITCHBOARD RECONSTRUCTION.—The Electricity Commissioners have sanctioned the reconstruction of the main 20,000-V switchboard at the Corporation's Dalmarnock generating station. The estimated cost of the proposed reconstruction is £150,000.

Haltwhistle (Northumberland).—ELECTRIC LIGHTING.—The Council proposes to replace the existing gas lighting system by an electrical installation. It has been decided to ask the North-Eastern Electric Supply Co., Ltd., to submit an estimate of the cost.

Harwich.—SUPPLY EXTENSION.—The Council proposes to supply electricity to the Seaton holiday camp, Dovercourt. The estimated cost is £1,357.

Hull.—LOAN.—The Electricity Committee has obtained sanction to borrow £68,625 for mains and plant.

India.—TUBE-WELL SCHEME.—For the Rampur tube-well scheme which was recently inaugurated an electricity supply is obtained from a hydro-electric plant on the River Ganges at Salawa, 200 miles away. At Rampur electricity is utilised for lifting water for irrigation from the large reservoir 15 ft. below the fields. At the inaugural ceremony Sir William Stampe, chief engineer of the United Provinces, explained that the ten tube-wells then opened were merely the first instalment of a system of thirty-four wells. This project was initiated in 1935 as a substitute for a canal. Not only had the capital outlay on the wells been considerably less than that of a river canal, but the annual expenses were lower. On the economic side, it had been established that, provided the rate charged to the cultivator per kWh was suitably varied according to the depth of the water, irrigation could be commercially effected from underground sources at depths varying from 15 to 35 ft. He said that by means of cheap electric power not only could irrigation be extended by means of pumping stations scattered throughout the countryside, but the individual grower was enabled to process the grain thus produced. By treating it locally he could intercept a larger share of the profits which would otherwise pass to the middleman or to the wholesale buyer in the towns nearby. The recent electrification of several hundred private farms in the adjoining districts of the United Provinces had clearly demonstrated the value zamindars could derive from such operations. An interesting feature of rural economics now being explored in electrified districts was the development of seasonal industries operated only during off-peak hours.

Llanrwst.—LOWER LIGHTING CHARGE.—The North Wales Power Co. has intimated that a reduction to 6d. per kWh is to be made in the flat-rate lighting charge as from July 1st.

London.—BERMONDSEY.—The baking ovens of the Labour Bakery, Dunton Road, are to be converted to electric heating, and application is being made for a supply for this purpose up to a maximum of 500 kW.

HAMMERSMITH.—Mains are to be extended to Wormwood Scrubs. The prison authorities propose to provide all-electric facilities at six blocks comprising thirty-six staff flats on the Ducane Road frontage.

The Electricity Committee is to provide a supply to a new factory of Lancegaye Safety Glass, Ltd., in Hythe Road, at a cost of £1,595.

Additional reactors are to be provided at a cost of £5,280 at the Council's generating station in order to deal with the progressively increasing demand for electricity supply.

POPLAR.—A revision has been made in the tariffs for public lighting and industrial power at a cost to the undertaking of £6,000.

The Electricity Committee has considered an application of the Bethnal Green electricity undertaking for a bulk supply of electricity for a period commencing April 1st, 1938, and a tender is to be submitted.

STOKE NEWINGTON.—For some time the Highways Committee has had under consideration the improvement of public lighting in Stoke Newington High Street, Stoke Newington Road, Stamford Hill and Crossway, and a scheme has now been

"Porte de la Concorde," illuminated for the Paris International Exhibition

prepared for the installation of mercury electric-discharge lamps in conjunction with the Hackney Borough Council's scheme.

In response to an application from the London County Council the Electricity Committee has decided to offer electrical appliances at 1s. per quarter for use in the cookery classes held in County Council schools in the area, electricity being supplied at ½d. per kWh.

ST. PANCRAS.—The installation of electric-discharge lamps in roads included in a scheme recently approved by the Council is held up by delay in the delivery of the standards. It is proposed, however, to use the lamps in equipping standards which were erected in Gray's Inn Road and Kentish Town Road for the dual purposes of the Coronation decorations and new street lighting. The improved lighting in these roads is estimated to cost £4,698, including £2,014 for mains.

Lowestoft.—ILLUMINATIONS.—A scheme for the illumination of the Upper Esplanade at a cost of £450 has been approved by the Corporation.

Maidstone.—CHEAPER ELECTRICITY.—The Town Council has reduced the charges for electricity as under, at an estimated yearly cost of £5,715: Lighting, from 4d. to 3¾d. per kWh; heating and cooking, from ¾d. per kWh all the year round

The success which attended the initial lighting of streets in Preston with Siemens "Sieray-Dual" electric-discharge lamps has prompted the Corporation to extend the system with 300- and 500-W lamps, coverin gsome hundreds of points. The photograph is of Fishergate Hill

to ¾d. in the winter and ½d. in the summer; two-part tariff, reduction of running charge to ¼d. per kWh during the summer; all-in tariff, reduction of running charge to three kWh a penny during the summer; small power, reduction from 1¼d. to 1¼d. per kWh. There are also lower charges for supplies in the outer area.

Manchester.—LIGHTING FITTINGS FOR HIRE.—The Electricity Committee has obtained sanction to borrow £5,000 for public lighting fittings for hire.

Nelson.—SUGGESTED JOINT BOARD.—In connection with the proposals for the reorganisation of electricity distribution it has been suggested that Nelson, Colne, Brierfield, Earby and Barnoldswick should form a joint board. Various conferences have been held.

Nigeria.—ELECTRICAL PROGRESS.—The Electrical Branch of the Public Works Department, of which Mr. C. H. Pickworth is electrical engineer-in-chief, operates power stations at Lagos, Port Harcourt, Kaduna, Enugu, Kano and Abeokuta, the first mentioned being the largest. Excluding Abeokuta and Kano, where the systems have only comparatively recently been taken over, the sales increased by 714,000 kWh (10 per cent.) to 8 million kWh in 1935-36 (Lagos, 5¼ million kWh). Waste wood was used in conjunction with coal for fuel at the Lagos power station, and when this was burnt during hours of light load economies were effected. Experiments were carried out with a mixture of coal and sawdust with satisfactory results. At Enugu coal below ¼-in. size was tried and the question of using this type of fuel is under consideration. During the past five years the coal consumption per kWh generated at Lagos has been reduced from 4.42 lb. to 3.52 lb. The price per ton of coal delivered ranged from 8s. 9d. in the case of Enugu to 30s. 1d. at Lagos and 53s. 9d. at Kano. Charges to consumers compared favourably with those in other towns of the West Coast. At Lagos and Enugu the average price of the first 180 kWh per month for residential and domestic purposes was 1.67d. and at Port Harcourt and Kaduna 2.25d. The price of power at Lagos and Enugu averaged 1d. for the first 180 kWh per month, and at Port Harcourt and Kaduna, 1½d.

Portland.—EXTENSIONS.—Sanction has been obtained by the Electricity Committee to a loan of £4,594 for extensions.

Rawtenstall.—LOAN.—Sanction is being sought by the Town Council to borrow £32,750 for mains extensions, services, and high-voltage feeders.

Seaham Harbour.—AMALGAMATION PROPOSALS.—The Urban District Council has adopted a recommendation that steps shall be taken to secure the amalgamation of Seaham with Sunderland and South Shields, rather than accept the scheme outlined by the Ministry of Transport. The Council considers that it will be better to approach Sunderland and South Shields with a view to bringing about a fusion of local authorities than to be taken over by private enterprise. It has decided to accept an invitation from the Mayor of Sunderland to send representatives to a local authorities' conference at the Sunderland Town Hall on June 8th to consider the Ministry of Transport proposals.

Sheffield.—MAINS.—Sanction has been obtained to a loan of £5,560 for extra-high-voltage mains for providing a supply of electricity to the premises of Hadfields, Ltd., and £3,188 is to be spent on other mains extensions.

Salop.—ELECTRICITY IN QUARRIES.—The Roads Committee has considered the desirability of superseding by electricity the present steam power used at the County Council quarries, as facilities for obtaining a supply are now available. It is stated that the annual running cost of the existing crushing plant could be substantially reduced if electric drive were to be substituted.

Slough.—ELECTRIC-DISCHARGE LIGHTING.—Following the report of the surveyor on a demonstration with an 80-W electric-discharge lamp the Urban District Council has given authority for the purchase of 22 lamps to improve the lighting on the Council's housing estate in the Stoke Poges Lane and Belgrave Road district.

Stockton-on-Tees.—LOAN.—Sanction has been received by the Town Council to a loan of £1,580 for a sub-station and plant at Bishopton Road.

Stoke-on-Trent.—SUPPLY TO NEW BATHS.—A bulk supply is to be given by the Electricity Committee to the new baths proposed to be erected at Stoke at 0.2d. per kWh.

VOLUNTARY SCHEME DISCUSSED.—At a meeting of the Electricity Committee on April 27th it was recommended that the North-West Midlands Joint Electricity Authority should be informed that the Committee was prepared to accept the Authority's recommendation that a voluntary scheme for the amalgamation of all the electricity undertakings in the North-West Midlands District should be submitted to the Electricity Commissioners. The Committee subsequently considered a draft scheme for the acquisition by a newly constituted authority of all undertakings in the North-West Midlands area and recommended that this draft scheme should be forwarded to the Electricity Commissioners as an alternative to a compulsory scheme. When the City Council met last week, however, a member moved the deletion of the recommendations involving approval of the draft voluntary scheme and its submission to the Commissioners; this was approved.

Tipton.—SUB-STATION.—The Midland Electric Corporation for Power Distribution, Ltd., is to erect a sub-station on the Tipton Green estate.

Weymouth.—CABLE EXTENSIONS.—The Electricity Committee is to extend its cables at a cost of £2,100.

Traction

Birkenhead.—APPEAL AGAINST COURT RULING.—The Corporation is to appeal against the decision of the High Court in the action by the Corporation for injunctions to restrain the Liverpool Corporation from supplying electricity to the Wirral Railway Co., and the L.M.S. Railway Co. from taking such supply.

Brighton.—TRANSPORT SCHEME.—The Council has approved in principle a report by independent experts on a scheme whereby the bus services of the Brighton, Hove & District Omnibus Co., Ltd., would be run jointly with the system of the Council, whose trams would be replaced either by trolley-buses or petrol buses.

China.—TROLLEY-BUSES.—Fifteen new A.E.C. trolley-bus chassis are being shipped to China in fulfilment of a recent

A trolley-bus in Shanghai

order by the Shanghai Electric Construction Co. With these, there will be nearly 300 trolley-buses with A.E.C. chassis in commission in the Far East. The accompanying illustration shows one of the "603T" single-deck models operated by the Shanghai Co., which builds the bodies. First- and second-class compartments are provided, the entrances being protected by lattice-gates.

France.—"METRO" DEFICIT.—The Paris "Metro" this year will have a deficit estimated at 300 million fr., states the Paris correspondent of the *Railway Gazette*. This is said to be due to rising labour costs involved by the application of the new social laws (the 40-hour week means the addition of 2,300 to the working staff), the increased cost of materials and heavy expenditure on extensions. Increases in fares are contemplated.

INTERNATIONAL CONGRESS.—From May 31st to June 11th the thirteenth session of the International Railway Congress Association is being held in Paris. The subjects which are being discussed include methods and devices used in connection with electric traction to save electricity between the power station and the driving wheels (feeders, sub-stations, tractors) and, in particular, the use of mercury rectifiers. Evolution of the rail-car, the use of welding, and the maintenance of signals and the metal supports carrying electric contact wires are also before the meeting.

Liverpool.—TRANSPORT REVENUE.—In the year ended March 31st last the total revenue from the Corporation trams was £1,356,410 and from the buses £221,297, the operating costs being £1,164,404 and £178,953, respectively. After allowing for various charges the net surpluses were £85,378 from the trams and £437 from the buses. Tram passengers were less than in the previous year, but Mr. W. G. Marks, the general manager, states that since September there has been a steady increase in the number. During the past year ninety-nine new bogie trams were placed in service and a further sixty-three were under construction at the end of the period.

Newcastle-on-Tyne.—TROLLEY-BUSES.—A decision has been reached by the Transport Committee to introduce trolley-bus services in the city area. The routes most likely to be converted first are those where tram-track renewal will soon be necessary. Among new trolley-bus routes will be Osborne Road, Westmorland Road and Fenham. The trolley-buses for the Stanhope Street-Welbeck Road system will be delivered, it was reported to the Committee, in July, and the service will be inaugurated in August. The City Council's first trolley-bus service, to Wallsend, was started eighteen months ago.

South Africa.—TROLLEY-BUS TAXATION.—A compromise has been reached in a trolley-bus dispute at Cape Town, states the *Passenger Transport Journal*. The Administrator of the Cape, Mr. J. H. Conradie, has promised that the Cape Provincial Council will review its decision to tax each trolley-bus £75 per annum, and will reduce the tax by half. It is believed that this will satisfy the tramways company and that it will now go ahead with the Sea Point extension which it had threatened to hold up.

United States.—FURTHER ELECTRIFICATION.—The Pennsylvania Railroad has awarded contracts to five companies for electrification work, states the official organ of the American I.E.E. The chief sections now to be electrified are the main line from Paoli, near Philadelphia, to Harrisburg, Pa.; the freight line from Morrisville, Pa., near Trenton, N.J., to Harrisburg; the freight line from Columbia, Pa., to Perryville, Md.; and the freight line from Monmouth Junction to South Amboy, N.J. This will mark the completion of the original electrification programme on the eastern lines as announced in 1928. The new work will involve the electrification of 315 miles of line and 773 miles of track. Upon completion of the work the Pennsylvania Railroad system will have 2,677 miles of electrified track. It has been decided to employ cross-catenary construction, based on a system of overhead conductors held in place by an arrangement of flexible wires supported between structural steel poles set in concrete beds beyond the outer edges of the track.

Communications

Canada.—A LARGE RADIO STATION.—A *Reuter* message from Toronto, Ontario, states that the construction of Canada's largest radio station is expected to be undertaken shortly and to be completed in October. Two 750-ft. towers are to be built thirty miles from Toronto. The equipment for the station will be the most powerful in the Dominion.

Great Britain.—CHEAPER RADIO-TELEPHONE CALLS.—As from June 1st the following reductions have been made in radio-telephone three-minute calls, the previous charges being given in parentheses. India, £3 (£4 10s.), Monday to Saturday. Ceylon, £3 6s. (£4 16s.), Monday to Saturday. Japan, £4 16s. (£6), Monday to Friday; £2 8s. (£3), Saturday. South Africa, £3 charge applicable on Saturday morning and afternoon extended to all weekdays after 3 p.m.; in the case of Southern Rhodesia the charge is £3 9s. and Northern Rhodesia £3 15s.

FINANCING TELEPHONE DEVELOPMENT.—A financial resolution presented to Parliament by the Postmaster-General seeks to authorise the issue of a further £35,000,000, of which £32,000,000 is required for the telephone service.

Italy.—BROADCASTING PLANS.—In the new Convention signed between the Italian Broadcasting Company and the Government there are extensive plans for expansion. Five short-wave stations are to be built for broadcasting to the Italian colonies. Two of these stations are to have a power of 100 kW; of the remaining three, two are to have a power of 40 kW and one of 50 kW. The 100-kW medium-wave stations for Rome and a new broadcasting house for Turin are also to be erected. Work has already begun on the two Rome transmitters, and it is hoped that the stations will be in operation by the late summer. The total number of Italian listeners on March 31st was only 719,000.—*Wireless World*.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—June 14th. U.D.C. Electricity Department. Transformers, e.h.v. switchgear and e.h.v., p.i., l.c. cable. (May 28th.)

Amble.—June 7th. U.D.C. Twelve seamless steel tubular poles for street lighting and seven stone standards, complete with fittings; prepayment and quarterly meters; underground mains and services in connection with the Westfield housing estate. W. C. Roy, electrical engineer, Electricity Department, Dilston Terrace.

Ardrossan (AYRSHIRE).—June 7th. Town Council. Electric lighting at 102 houses. Joint town clerks, Burgh Chambers (deposit £1 1s.).

Australia.—BRISBANE.—July 5th. City Electric Light Co. Relays to replace those existing at four sub-stations. (T.Y. 31392.)* 11,000-V switchgear, &c. (T.Y. 17779/37.)*

Barrow-in-Furness.—June 14th. Gas and Water Committee. Two electrically driven multi-stage centrifugal pumps (75-gal per minute each against a head of 140 ft.), with automatic switch and control gear, &c. Engineer and manager, Gas and Water Department, Salthouse Gasworks (deposit £1 1s.).

Beckenham.—June 28th. Borough Council. Coal. (See this issue.)

Bexley.—June 21st. U.D.C. P.i. underground cables for one year. (May 28th.)

Blackpool.—June 22nd. Borough Council. Electrically driven passenger lift (to carry twenty-five persons), in the North Shore lift tower. Borough Surveyor's Office, Municipal Buildings, Talbot Square (deposit £1).

Bradford.—June 16th. Corporation. Three-phase static transformers. (See this issue.)

Bredbury and Romiley.—June 7th. U.D.C. Electricity Department. L.v. and h.v. p.i. cables for the period ending April 30th, 1938. (May 21st.)

Bristol.—June 21st. Health Committee. L.v. underground cables, switchgear, &c., at Ham Green Hospital, Pill, and electrical services in a nurses' home and three maternity ward blocks at Southmead Hospital. (May 28th.)

Croydon.—June 9th. Electricity Department. Stores and materials for twelve months. (May 21st.)

Dewsbury.—June 14th. Electricity Department. 11,000-V metal-clad switchgear. (See this issue.)

Edinburgh.—June 11th. Corporation. Electrical installation in Bonnington Road and North Fort Street schools. City Architect's Office.

Egypt.—CAIRO.—July 5th. Ministry of Public Works. 70-kW d.c. Diesel generating set. (T.Y. 31408.)*

Glasgow.—June 12th. Clyde Navigation Trust. Electrical stores. Stores superintendent, No. 1, Graving Dock, Govan.

Hastings.—June 11th. Electricity Department. L.v. switchgear for the Gypsum Mines sub-station, Mountfield. (See this issue.)

Hoylake.—June 28th. U.D.C. Electrically driven borehole pumping plant at Newton pumping station. Water engineer, Town Hall.

Irish Free State.—DUBLIN.—June 26th. Electricity Supply Board. Boiler plant and auxiliaries at the Pigeon House generating station. (May 21st.)
July 31st. 110-kV and 38-kV switchgear and control equipment. (See this issue.)

Littleborough.—June 15th. U.D.C. Electricity Department. One three-cubicle e.h.v. switchboard, one truck type l.v. switch cubicle, one l.v. metering and neutral panel, and one distribution pillar. (May 28th.)

Liverpool.—June 25th. Corporation. H.v. and l.v. switchgear for static sub-stations during two years. (See this issue.)

London.—METROPOLITAN WATER BOARD.—July 1st. Two sets of electrically driven centrifugal pumps at the Hammersmith pumping station. Chief engineer, Room 235, Offices of the Board, 173, Rosebery Avenue, E.C.1 (deposit £2 2s. to the Comptroller of the Board).
HAMMERSMITH.—June 11th. Borough Council. E.h.v. and h.v. switchgear. (May 21st.)
WANDSWORTH.—June 28th. Borough Council. Wiring of houses, flats and maisonettes. (May 28th.)
WEST HAM.—July 2nd. Borough Council. Electrical installation in a new Colony for Mental Defectives, South Ockendon. (May 28th.)

Manchester.—June 23rd. Electricity Committee. Twelve months' supply of weldless steel lamp columns and fittings. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

Middlesex.—June 21st. County Council. Electrical installation at the new elementary school, Hibbert Road, Harrow Weald. (May 21st.)
June 28th. Electric lighting, power, clocks, bells, wiring to telephone points, and service cables in blocks 11 and 12 at the Chase Farm schools; and lifts at Hillingdon County Hospital and Chase Farm schools. (See this issue.)
June 28th. Electrical cooking apparatus in connection with the remodelling of the Chase Farm schools, Enfield. Particulars from C. W. Radcliffe, clerk of the County Council, Guildhall, London, S.W.1 (deposit £2 2s.), by June 7th.

Middlesbrough.—June 28th. Electricity Department. Two 600-kVA transformers. (See this issue.)

Newcastle-under-Lyme.—June 22nd. Electricity Supply Department. One two-cubicle e.h.v. switchboard, two 250-kVA transformers, and one l.v. metering and neutral panel. (See this issue.)
July 6th. Three-phase 6.6-kV transmission line. (See this issue.)

New Zealand.—WELLINGTON.—Public Works Department. September 7th. 5,000-kVA transformer bank. (T.Y. 17784/37.)*

Northern Ireland.—BELFAST.—June 14th. Electricity Committee. Mercury arc rectifier equipment and additions to timber wharf and crane rail siding. (May 28th.)
June 7th. Harbour Commissioners. One 7-ton level luffing electric crane at the Donegall Quay. Harbour engineer, Harbour office.

Nuneaton.—June 11th. Electricity Department. Kiosk sub-station, with e.h.v. and l.v. switchgear and 200-kVA transformer. (May 28th.)

Oldham.—June 21st. Passenger Transport Committee. Electric lighting and power installation at the new Central Bus Garage, Wallshaw Street. (See this issue.)

Preston.—July 6th. Electricity Department. House service type electricity meters, domestic water-heating apparatus, and breakfast cookers. (See this issue.)

Rhondda.—June 26th. Electricity Committee. Three-phase static transformers. (May 28th.)

Sandbach.—June 14th. U.D.C. Electrically driven pumping plant. (See this issue.)

South Africa.—JOHANNESBURG.—July 19th. Railways and Harbours Administration. Twelve electric locomotives with electrical spares and alternative quotations for twenty-two electric locomotives with spares. (T. 2593.)*
PRETORIA.—June 23rd. City Council. Two 12,000-V switchboards and one accumulator battery. (T.Y. 31398.)* E.h.v., l.v. and telephone cables. (T.Y. 31397.)* Two 500-kVA and three 300-kVA transformers. (T.Y. 31401.)*
July 16th. Public Works Department. Three electric lifts. (T. 17817/37.)*

Spenborough.—June 21st. U.D.C. One 500-kVA transformer and one 11,000-V metal-clad switchboard. (See this issue.)

Thingoe.—June 16th. R.D.C. Electrically driven pump in connection with the water supply to the Parish of Ixworth. Particulars from G. Lister Coates, Council's engineer, Abbeygate Street, Bury St. Edmund's (deposit £2 2s.), by June 5th.

Tiverton.—June 5th. Town Council. Overhead and underground lines. (May 28th.)

Tottenham.—June 21st. Education Committee. Electrical installation in the Earlsmead, Seven Sisters and Coleraine Park schools. (See this issue.)

Tyldesley.—June 30th. U.D.C. Three pumps, complete with electric motors, automatic float controlled switchgear, &c., for the pumping station, near Miners' Arms, Astley. F. E. Jones, Council's engineer and surveyor, Town Hall (deposit £2 2s.).

Uruguay.—MONTEVIDEO.—July 19th. State Electricity Supply and Telephones Administration. Bare copper conductors. (T.Y. 31405.)*

West Hartlepool.—June 15th. Borough Council. Twelve months' supply of h.v. and l.v. cables. (May 28th.)

West Riding.—June 14th. Mental Hospitals Board. Three-wire balancer for the generating plant at the Wakefield Mental Hospital and lighting installation at Wadsley Mental Hospital. W. E. H. Burton, architect and engineer to the Board, Mental Hospital, Wakefield.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Recommended. Switchgear (£655).—Crompton, Parkinson.

Barnes.—Town Council. Accepted. Electrical installations in connection with the erection of 146 flats and two shops.—S. N. Fordyce.

Basingstoke.—Electricity Committee. Accepted. L.v. cable and bare copper conductor and binding wire for the Overton mains renewal.—Hackbridge Cable Co.

Colchester.—Education Committee. Accepted. Electrical installations in the St. Helena Council school (£1,095).—E. H. Ruddock.

Durham.—County Education Committee. Accepted. Electrical installations in schools: Dubmire Council (£112), East Boldon Council (£85), Houghton-le-Spring Council (£230), and New Seaham Low Colliery (£83).—Falconar Cross & Co. Shotton New Council (£364), Hare Law Council (£58), and Westwood Council (£140).—R. Robson. Washington Colliery Council (£85).—F. Reid, Ferens & Co.

Glasgow.—Health Committee. Accepted. X-ray apparatus at the Knightswood Hospital (£888).—Newton & Wright.
Housing Committee. Accepted. Electrical fittings and cable for one year.—W. Geipel; G.E.C.
Libraries Committee. Accepted. Renewal of electrical installations at Possil Park Library.—H. M. Fulton; at Townhead Library.—Kennedy, Stark & Co.
Transport Committee. Accepted. Electrodes.—Quasi-Arc Co.; Murex Welding Processes; Met.-Vick. Elecl. Co.

Hemel Hempstead.—R.D.C. Accepted. Electric lighting in houses at Ardece, Tower Hill, Mill Lane and Chesham and Newhouse.—Messrs. Danley, Whitton.

Hull.—Telephones Committee. Recommended. L.c. cables (£1,297).—Power & Lighting Cables.
Education Committee. Accepted. Electrical installation at Kingston High school (£2.799).—Booker & Tarron.
Electricity Committee. Accepted. Controlling gear for Dunswell intake (£750).—J. Blakeborough & Sons.

Irish Free State.—PORT LAOIGHISE.—Mental Hospital Committee. Electrical installation in the new extension of the Hospital :

	£		£
M. F. Kent. Accepted	**3,210**	Clancy, Limerick	4,805
Electricity Supply Board ...	3,645	Bective Electrical Co.	4,825
P. Lynch & Co.	3,961	Heydons	5,028
Thompson & Co.	4,019		

Kirkcaldy.—Town Council. Accepted. Electrical contract for the new housing estate at Strathkinnes Road (£3,058).—Moncrieff Bros.

Lanarkshire.—County Council. Accepted. Electrical work in connection with ninety-two houses on the Eastfield estate, Harthill (£564).—J. A. Denholm.

London.—BERMONDSEY.—Electricity Committee. Accepted. H.v. switchgear (£409).—A. Reyrolle & Co. L.v. switchgear (£118).—Crompton Parkinson.
L.C.C.—Wiring and fittings for electric lighting, &c., in blocks 7 (remainder), 8 (remainder), 12 and 13 of dwellings on the Stamford Hill estate, Hackney :

	£		£
Archibald Meckhonik. Accepted	**2,650**	Buchanan and Curwen	2,817
Evans and Shea	2,656	Bective Electrical Co.	2,910
Jacob, White & Co.	2,759	F. G. Edey & Co.	2,918
Samuel Reed & Sons	2,790	Ilford Electrical Co.	3,126
F. H. Wheeler & Co.	2,814	Higgs and Hill	4,124

Wiring and fittings for electric lighting in blocks A and B of the Chelsea Institution :

	£		£
Atozed (Kingston) Ltd. Accepted	**1,111**	W. H. Gaze & Sons	1,196
Pinching and Walton	1,147	Jacob, White & Co.	1,212
Samuel Reed and Sons	1,170	Bective Electrical Co.	1,404
Electrical Installations	1,184		

Electrical wiring and fittings at the Ardale approved school :

	£		£
G. E. Taylor & Co. Accepted ...	**2,175**	Davis Myer & Co.	2,560
City Electrical Co.	2,248	A. Hawkins & Sons	3,249
Read and Partners	2,344	Gillham and Jones	3,325
Springvale Electrical Co. ...	2,389	Collins Electrical	3,396

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Vehicle-actuated traffic control signals at the intersection of Judd Street, Euston Road and Midland Road (£773) and the intersection of King Street and High Street, Camden Town, and Pratt Street, High Street and Delancey Street (£1,695).—Siemens & General Electric Railway Signal Co. Similar signals at the intersection of St. Paul's Road, King's Road and Randolph Street (£652).—Automatic Telephone & Electric Co. Three sets of 6,600-V, 3-phase, metal-clad switchgear required for the High Street, James Street and Wells Street sub-stations (£793 per set).—A. Reyrolle & Co. Extension of existing contract for cables for a further twelve months.—Standard Telephones.

Manchester. — Electricity Committee. Accepted. Time switches.—Venner Time Switches. Service cut-outs.—Siemens Bros.; Parmiter, Hope & Sugden. House-service switchgear at the Stuart Street power station.—Met.-Vick. Elecl. Co.

Middlesbrough.—Town Council. Accepted. Electrical installation at the new fire station (£4,165).—Graham Bros.

Middlesex.—Education Committee. Accepted. Electrical installation at Wembley Park school (£1.746).—G. A. Weston.
Health Committee. Recommended. Electrical installation at Shenley Colony (£8.085).—Read & Partners.

Morecambe.—Electricity Committee. Accepted. Cables.—W. T. Glover & Co.

Newton Abbot.—R.D.C. Accepted. Electrical wiring at eighty-two houses (£219).—R. H. Whittaker.

Smethwick.—Education Committee. Accepted. Electrical installation at Smethwick Hall schools (£3,329).—F. Burton.

Stoke-on-Trent.—Housing Committee. Accepted. Wiring and fittings for eighty-four houses on the Goldenhill estate (£450) and for eighty-two houses on the Hanford estate (£456).—E. Holloway.

West Hartlepool.—Town Council. Accepted. Electric cables.—Callender's; B.I. Cables; Enfield Cable Works.

Weymouth.—Electricity Committee. Accepted. Cables, switchgear and transformers for the supply to Lulworth.—Pirelli-General Cable Works.

Forthcoming Events

Institution of Electrical Engineers *(Wireless Section).*—Thursday, June 10th. Visit to the Television Exhibition, Science Museum, London.
South Midland Students' Section.—Saturday, June 12th. 3 p.m. Annual summer meeting. Visit to the Droitwich Broadcasting Station, Wychbold.
Transmission Section.—Friday, June 18th, to Monday, June 21st. Visit to Holland.
Electrical Contractors' Association of Scotland.—Friday, June 4th, to Monday, June 7th. Peebles Hydro. Annual conference.
British Standards Institution.—Tuesday, June 8th. Dorchester Hotel, London, W.1. 12.45 for 1 p.m. Annual luncheon.
Diesel Engine Users' Association.—Wednesday, June 9th, Crewe. Summer meeting.
Institution of Heating & Ventilating Engineers.—Tuesday, June 22nd. Summer meeting.
Association of Supervising Electrical Engineers *(London Branch).*—Saturday, June 26th. 2.30 p.m. Visit to the Pinewood Studios, Iver.
Junior Institution of Engineers.—Saturday, June 26th. Summer excursion to Stratford-on-Avon and district.

Notes

E.I.B.A. Secretaryship

In this issue there appears an advertisement by the Electrical Industries Benevolent Association for a secretary to prepare and conduct appeals and organise collections and the distribution of relief. It is required that applicants shall have secretarial, accountancy and staff management experience and be "convincing and tactful" interviewers.

French International Congress on Lighting

At the International Congress on Lighting Applications organised in Paris by the Association of Illuminating Engineers under the patronage of the French Committee of Lighting and Heating, a women's session has been arranged on June 28th. A paper on "Women's Contribution to Lighting Education in Great Britain" will be given by Miss Caroline Haslett. Miss Andrée Trolliet, of Switzerland, will give a paper on "Women and Propaganda for Better Lighting," and a paper and demonstration on "The Work of Home Lighting Advisers" will probably be given by Miss L. Eddy, of the United States. During the afternoon an official visit will be made to the Paris Exhibition. As a result of inquiries from members of the E.A.W. wishing to attend the congress, Cook & Sons have arranged a special week-end trip. Full details will be sent on application to the E.A.W., 20, Regent Street, S.W.1.

E.A.W. (Yorkshire & Mid-east Area) Conference

The Harrogate and District Branch of the E.A.W. entertained the Yorkshire and Mid-East Area of the Association which held a one-day conference in the Royal Spa Rooms on May 27th. Lady Watson (president, Yorkshire and Mid-East Area), opened the conference. Miss Vaughan, deputising for Mrs. Pender Chalmers (vice-chairman of the National Executive) gave an address on "Public Speaking." In the afternoon Miss Vaughan spoke on "Kitchen Planning," and after tea in the Spa Rooms there was a talk on "Committee Procedure" by Miss Foster Jeffery.

The "Civils'" Conversazione

The annual conversazione of the Institution of Civil Engineers took place on Wednesday, when in addition to exhibits by the National Physical Laboratory, the Forest Products Research Laboratory, the Building Research Station, the Road Research Laboratory, the General Post Office and the Ordnance Survey Department and by many members of the Institution and other engineers, there were two special exhibits, one dealing with the development of methods of construction of roads and bridges from Roman times to the present day and the other with television apparatus. A tablet to Thomas Telford, F.R.S., was unveiled by the President, Sir Alexander Gibb, G.B.E.

Appointments Vacant

Shift charge engineer and electrical assistant in the power stations of the Castner-Kellner Alkali Co., Ltd.
Junior electrical engineers for the I.F.S. Electricity Supply Board.
Lady demonstrator and showroom assistant for Cleethorpes Electricity Department.
Meter tester and repairer for the London and Home Counties J.E.A.
University graduate in engineering for the Junior Technical School, Portsmouth.
Junior charge engineer for Barrow-in-Furness Electricity Department.
General clerk for Peterborough Electricity Department.
Technical assistant, chief draughtsman and draughtsman (mechanical) for the North Metropolitan Electric Power Supply Co.
Assistant installation inspector, male meter records clerk and junior male showroom clerk for Hornsey Electricity Department.
Assistant sub-stations superintendent for Bradford Electricity Department.
Mechanical or electrical engineers for commissions in the R.A.O.C.
Probationer station engineers (electrical and mechanical) and temporary mechanical and electrical engineering assistants for the Air Ministry.
Electrical engineer for pumping station for East Dean R.D.C.
(See our classified advertisements.)

Our Service Department

VERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following :—

MAGIC electric toaster.
PAPLEX hard drawn overhead cable.
BEACON flasher lampholder.
3-h.p. motor rated at over 3,000 r.p.m. for woodworking.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. C. Paterson has been elected president of the Institute of Physics for the session 1937-38.

Mr. T. Wadsworth, M.Sc., of the British Thomson-Houston Co., Ltd., has been nominated for the chairmanship of the Wireless Section of the Institution of Electrical Engineers for the session 1937-38.

Mr. H. C. Turner, of Salford Electrical Instruments, Ltd., has been nominated as chairman of the Meter and Instrument Section of the Institution of Electrical Engineers for the ensuing session.

Captain J. Young has recently terminated his position as maintenance engineer with the Associated British Picture Corporation (formerly B.I.P., Ltd.), at their Elstree Studios, and has accepted an appointment as chief engineer with London Film Productions, Ltd., at Denham, Uxbridge, where he has under his control Diesel generating plant totalling 7,500 h.p., which is claimed to be the largest independent plant in use in this country. In former years he was associated with the North Eastern Electric Supply Co., Ltd., and A. Reyrolle & Co., Ltd.

Capt. J. Young.

The Hon. T. H. Brand has been appointed a director of the North-Eastern Electric Supply Co., in succession to the Hon. R. H. Brand, who has resigned.

Mr. P. Dumenil, who has retired after twenty-seven years' service with the Marconi Wireless Telegraph Co., Ltd., at Chelmsford, has been presented by friends at the works with a gold watch. For twenty-six years Mr. Dumenil has been chairman of the Social and Athletic Club, whose members joined in the presentation.

Mr. A. McCubbin, Kilmarnock, has been appointed clerk of works (electrical) to the Housing Department of Ayr County Council. Mr. McCubbin has had twenty-one years' experience in the electrical trade. He was trained in the Royal Naval and Electrical and Torpedo School at Devonport. For over ten years he was employed in connection with electrical installations in H.M. ships. He served on the electrical staff of H.M.S. *Colossus* and H.M.S. *Resolution* as well as in other ships of a smaller type. He has been on the staff of the Ayrshire Electricity Board for the past ten years.

Mr. W. H. Chester, meter tester and repairer with the Hornsey Council Electricity Department, has been appointed meter repairer with the Stoke Newington electricity undertaking.

Mr. W. J. Collins, acting distribution engineer to the Stoke Newington Electricity Department, has been appointed first technical assistant at Bromley, Kent.

We are pleased to learn that **Mr. N. McLean,** borough electrical engineer of Harrogate, is making satisfactory progress after a serious illness, although it will be some time before he is able to resume his normal duties.

Mr. C. Burke, assistant shift engineer with the Hull Corporation electricity undertaking, has been appointed combustion engineer with the Southampton Electricity Department.

Mr. T. McLauchlin, of Stocksfield, Northumberland, who has been promoted to traffic superintendent (Class I) of the Post Office Telephone Service, Newcastle-upon-Tyne, has for the past six years been in control of the mechanisation programme for small exchanges in the North-East, and was previously in executive control of the traffic arrangements for the conversion of manual exchanges in the Newcastle area.

Mr. G. P. Dean, O.B.E., who is retiring from the position of secretary to the Trade Union side of the National Joint Industrial Council, was presented with a cheque in acknowledgment of his services to the Council, and a letter engrossed on vellum and bound in book form, at a recent annual meeting of the Council. Ald. Walker, who made the presentation, paid a tribute to Mr. Dean both officially and personally.

Ald. R. Roberts, who has been chairman of the Lancaster Corporation Electricity Committee since 1922, has resigned for health reasons and has been succeeded by Councillor J. L. Dirkin.

Sir Herbert Walker, general manager of the Southern Railway Co., is retiring as from October 14th next, and he will be succeeded by **Mr. G. S. Szlumper,** who is at present assistant general manager. **Mr. O. V. Bulleid,** assistant to the chief mechanical engineer of the London and North-Eastern Railway, has been appointed chief mechanical engineer of the Southern Railway as from November 1st, 1937, in succession to **Mr. R. E. L. Maunsell,** who is retiring from the service.

Mr. R. S. Hudson has been appointed Secretary of the Department of Overseas Trade in succession to Captain Euan Wallace, who goes to the Board of Trade as Parliamentary Secretary.

Mr. V. Z. de Ferranti, chairman of Ferranti, Ltd., was recently presented with a handsome volume bearing the signatures of the company's 2,000 girl employés. This being Coronation year, the girls employed at the two factories of Ferranti, Ltd., felt they would like to show their appreciation of the consideration consistently shown to them by Mr. Ferranti, who had provided them with satisfactory and comfortable conditions of employment. Each girl contributed a penny to a fund and signed her name on a sheet of parchment.

Mr. W. T. Langfield, assistant mains engineer with the Croydon Corporation, has resigned upon taking up an appointment as assistant mains engineer with the Bath Electricity Department.

Mr. C. Owen Silvers, general manager of the Wolverhampton Corporation Transport Department, and president of the Municipal Tramways and Transport Association, has accepted an invitation from the Royal Swedish Institute for Scientific and Industrial Research to deliver a lecture on trolley-buses at Stockholm.

Obituary

Mr. J. H. Wild, M.I.E.E., whose death occurred at his residence, Clive Lodge, Bedfont, on May 26th, served his apprenticeship with the General Electric Co. at Manchester and was subsequently commercial manager to the Lancashire Dynamo and Motor Co., Ltd., and works manager for the same company from 1915 to 1916.

[*Wykeham Studios*

The late Mr. J. H. Wild

In 1916 Mr. Wild was appointed to the staff of Vickers, Ltd., as assistant superintendent of electrical manufactures, and in 1921 he left them to join the board of Nathan & Allen, Ltd., with whom he remained until his death. Mr. Wild was a highly trained engineer with a wide experience in the manufacture of all types of electrical machinery. He had carried out many large electrical contracts for the equipment of mills, factories, and hydro-electric and steam-driven power-houses. He had travelled extensively overseas, where he had many friends. He leaves a widow and one married daughter.

Mr. W. J. Furse.—The death occurred on May 28th, at the age of seventy-eight, of Mr. William Joseph Furse, founder of W. J. Furse & Co., Ltd., electrical engineers, of Nottingham. Mr. Furse started business on his own account by purchasing the electrical business of the late Mr. Josiah Till at about the time that the Nottingham Corporation was erecting the generating station in Talbot Street. For nearly forty-five years he had taken an active part in the local government of West Bridgford.

Mr. J. Cathcart Christie, engineer and manager of the Arbroath Electric Light and Power Co., Ltd., died on May 25th at the age of sixty-two. He had been manager of the local company since it was formed in 1907, while he was also district manager for the Grampian Electricity Supply Co. After serving his apprenticeship with Douglas Fraser & Sons, Ltd., engineers, Arbroath, he was for a time in the service of Sir William Arrol & Co., Glasgow, afterwards going to the Woolwich works of Siemens Bros. & Co., Ltd., with whom he remained for three years. He subsequently entered the service of Glasgow Corporation and was one of the senior electrical engineers of the Corporation at the time of his appointment to Arbroath. He was an associate member of the Institution of Electrical Engineers.

Mr. J. MacLeod.—The death occurred on May 27th in London of Mr. John MacLeod, who was for many years secretary of the Oriental Telephone & Electric Co., Ltd.

Will.—Mr. S. T. Batley, director of Greenwood & Batley, Ltd., left £25,266, with net personalty £23,601.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Berners Radio, Ltd.—Private company. Registered May 26th. Capital, £10,000. Objects: To carry on the business of manufacturers of and dealers in wireless and television apparatus of all kinds, &c. The subscribers are: D. Mansfield, 7, Pagoda Avenue, Richmond, Surrey, and L. F. Weil, 56, Devon Avenue, Whitton, Middlesex. Registered office: Great West Road (corner of Ealing Road), Brentford, Middlesex.

Green & Ismay, Ltd.—Private company. Registered May 24th. Capital, £1,000. Objects: To carry on the business of retailers, wholesalers, importers, exporters, manufacturers and repairers of and dealers in radio sets, radio apparatus, &c. The directors are: A. Greenberg (permanent), 68, Boundary Road, St. John's Wood, N.W., P. Greene, 12, Barn Rise, Wembley Park, Middlesex, and C. Ismay, 4, Corringham Road, Golders Green, N.W. Secretary: P. Greene. Registered office: 268, Stretfield Road, Queensbury, Middlesex.

Modern Radio (Cheltenham), Ltd.—Private company. Registered May 27th. Capital, £1,500. Objects: To carry on the business of manufacturers of and dealers in gramophones and sound-reproducing machines, picture-producing, reproducing or transmitting apparatus, &c. The directors are: F. Stew, 31, Clarence Street, Cheltenham, and E. Borley, 192, Brooklyn Road, Cheltenham. Secretary: E. Borley. Registered office: 31, Clarence Street, Cheltenham.

Corona Electric Co., Ltd.—Private company. Registered May 29th. Capital, £1,500. Objects: To carry on the business of manufacturers of and dealers in electrical and radio machinery and apparatus, automobile electrical equipment, &c. The directors are: E. J. Owen, 47, Elwill Way, Beckenham; and T. K. Cordes, Flat 18, Central Parade, Orpington, Kent. Registered office: 171b, High Street, Beckenham, Kent.

Hygienic Telephone Equipment Co., Ltd.—Private company. Registered May 28th. Capital, £1,000. Objects: To carry on business as manufacturers of and dealers in telegraphic, telephonic and television apparatus, equipment and fittings, &c. The directors are: D. Harris and G. Harris, both of 14a, Lewin Road, S.W.16. Registered office: 5-11, Theobalds Road, W.C.1.

Returns of Electrical Companies

Rolyat Radio (Tooting), Ltd.—Frank H. Taylor, C.A., of 188, Mitcham Road, S.W.17, was appointed receiver and manager on May 18th, 1937, under powers contained in debenture dated April 13th, 1937.

Universal Electric Supply Co., Ltd.—Arthur T. Eaves, of 47, Mosley Street, Manchester, ceased to act as receiver on May 7th, 1937.

Hackbridge Cable Co., Ltd.—Charge on land and buildings at Hackbridge, Surrey, and a sinking fund policy, dated May 14th, 1937, to secure £50,000. Holders: Equitable Life Assurance Society.

Artic Fuse & Electrical Manufacturing Co., Ltd.—Capital, £5,000 in 4,700 ordinary and 100 deferred ordinary shares of £1 and 4,000 founders' shares of 1s. Return dated December 31st, 1936 (filed March 18th, 1937). 2,683 ordinary, 100 deferred ordinary, and 2,183 founders' shares taken up. £2,079 13s. paid on 1,983 ordinary and 1,983 founders' shares, £812 10s. considered as paid on 700 ordinary, 100 deferred ordinary and 250 founders' shares. Mortgages and charges nil.

Russell Wood (Barnet), Ltd.—Capital, £1,000 in £1 shares. Return dated April 7th, 1937. 905 shares taken up. £905 paid. Mortgages and charges nil.

Sedwin Electric, Ltd.—Ronald W. Smith, of 39-41, Earl Street, Maidstone, was appointed receiver and manager on May 15th, 1937, under powers contained in debenture dated March 19th, 1937.

Lacy-Hulbert & Co. (1921), Ltd.—Deposit on May 15th, 1937, of deeds of Boreas Works, Beddington, Surrey, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Super Radio (Whitechapel), Ltd.—Capital, £100 in £1 shares. Return dated October 31st, 1936 (filed March 3rd, 1937). All shares taken up. £100 paid. Mortgages and charges, nil.

Wireless Rentals (Northampton), Ltd.—The nominal capital has been increased by the addition of £300 in £1 ordinary shares beyond the registered capital of £200.

City Notes

Edmundson's Electricity Corporation, Ltd.—Presiding at the annual meeting held on May 27th Sir Thomas Royden (chairman) said that the block of shares formerly held by the Greater London and Counties Trust, a subsidiary of the Utilities Power and Light Co., of Chicago, had been acquired by a British syndicate, and now the corporation was almost entirely British owned and controlled. In the past year associated companies obtained 39,100 new consumers, making a total of 338,100, while over 116,900 kW of new load was added to the mains, making a total of 901,800 kW. The sales increased by 99,500,000 kWh, or 19 per cent., those during 1936 being 634,550,000 kWh. In addition, 56 million kWh was sold to the Central Electricity Board. During the four years from 1933 their policy of reducing prices had saved consumers £1,623,000, and it was regretted that progress in this direction had for the moment practically ceased owing to the continued increase in commodity prices. This was particularly felt in the case of coal, and there was a danger that in consequence a number of industrial users of electricity, would revert to oil-fired plant. Concerning the report of the McGowan Committee, the problem of the grouping of the small towns and rural areas called for treatment on a regional basis. The recommendation giving the power companies the controlling authority for the areas in which they operated was a statesmanlike one, for while the power companies had lived up to the rôle assigned them, the disintegration of their undertakings by the townships, under existing legislation, had rendered their task thankless and unremunerative. With regard to the problem of rural electrification, some local authorities only ventured into rural areas upon the receipt of guarantees from the Government, while they had no such favoured position. A Parliamentary Bill had now been passed consolidating the numerous companies which they controlled in Cornwall, and in advance of any Government intervention a regional grouping had been effected. Similarly, the Wessex Co. had a Bill before Parliament to provide, *inter alia*, for the consolidation of the small undertakings controlled by associated and other companies in the Wessex area. This, however, was likely to be delayed owing to the Electricity Commissioners seeking to insert a provision enabling them to dictate the terms and form which were to govern the issue by the Wessex Co. of new capital. It was to be noted that Edmundson's in its original rôle as contractor for electrical installations took from the operating companies only such profits as might accrue to the Corporation if it were not itself, through its associated companies, an actual distributor of electricity. A resolution authorising the conversion of the whole of the existing fully paid shares into stock was approved.

Telephone Properties, Ltd., held its annual meeting on May 28th, when Sir Alexander Roger (chairman), who presided, said that the Nacional Company of Venezuela had participated in the improved trend of business in that country. At December 31st, 1935, telephone stations had numbered 14,176 and had increased by 1,814 during the year to 15,990. Stations at this date exceeded the peak number existing prior to the depression. With regard to the Nacional Company's telephone rates, negotiations with the authorities had continued and progress had been made to the extent of the settlement of a formula which was to form the basis of the new tariff structure. It was hoped that during the current year discussions with the Venezuelan authorities would secure a method of charging which would enable the company to continue the policy which it had pursued of introducing modern equipment, establishing trunk services, &c. In Caracas the telephone service had been extended and 95 per cent. of the subscribers enjoyed a modern automatic telephone service. In conjunction with the Nacional Company they had studied the probable capital requirements during the next year or two for exchange equipment, telephones, cables, &c., and they thought that approximately £100,000 could be spent. If it was decided to proceed with this expenditure this would not require at present any issue of capital by them as they were associated with the Telephone & General Trust, both financially and technically.

The Madras Electric Supply Corporation, Ltd., held its annual meeting on May 26th when Mr. J. Gray (chairman), who presided, said that the normal expansion of business was maintained during 1936, the number of consumers connected increasing by 8.8 per cent., and the kWh sold by 7.8 per cent. Last year he reported that reductions had been made voluntarily in the rates charged for electricity, but as these had become operative at varying dates the gross revenue for the year had not suffered to the full extent. They were, therefore, budgeting for a further reduction in the current year. In October last the Madras Corporation commenced taking a supply for the pumping station at Kilpauk. The Corporation had also completed its arrangements for a h.v. supply for its new street lighting scheme; the probable effect of this would be a drop in revenue in the latter part of this year. They were arranging to provide a 5,000-V bulk supply to the area of a small Pauchayat Board at Villivakam, and rapid progress was being made in the construction of the 33-kV distribution system to the southern suburban area. The new 15,000-kW set in the generating station was nearing completion. With regard to the position of the tramways, this did not improve in 1936. Competition of motor-buses was unrelaxed, although everything was being done to meet it. However they could report an improvement in traffic receipts for the first four months of 1937.

The Dubilier Condenser Co., Ltd., held its annual meeting on May 28th, when Mr. G. F. Mansbridge (chairman), who presided, said that the year under review had been one of development and progress, of concentration and consolidation. While keeping to the same general lines of products they had broken a good deal of fresh ground in order to meet the more exacting requirements of the progressive radio industry. They had during the year concentrated all their productive work at Acton; the Shepherd's Bush premises had been sold and corresponding extensions at Acton had been built. Apart from the accommodation needed for the transferred work, additional factory and office space had become essential. With work of the company's character, dependent largely on an industry that was still developing, they had always to be on the look out for changes that were necessary to meet changed technical conditions as well as changes that resulted largely from fashion. Fortunately, their products, while centring principally on the radio industry, were of a diversified character, and that of itself tended to minimise the risk of a serious falling-off in overall demand. They continued to meet fierce competition not only from home manufacturers but from

abroad. In practice, they found themselves as regards overseas trade almost entirely confined to Imperial markets.

Richard Johnson & Nephew, Ltd.—Presiding at the annual meeting held on May 26th, Mr. M. A. T. Johnson (chairman) said that on the iron and steel side of the business the tonnage of orders booked constituted a record. Full workshops had brought about a general reduction in overhead charges, but this had been largely neutralised by the steady advance in the price of almost all their raw materials. The general reorganisation had contributed to the improved results, and in order that the employés should receive some share in the benefits of reorganisation they proposed to set aside £10,000 out of the year's profits to form the nucleus of a contributory pension fund. They had always paid keen attention to the export markets, and it was to be regretted, therefore, that owing to the shortage of steel they had been compelled to ration drastically their overseas customers as well as the home market. On the non-ferrous side, conditions had been more normal. The demand had been steady, and the tonnage booked showed a slight improvement during the year under review. The trade in aluminium wires for overhead conductor purposes had been quiet throughout the year. As regarded future business in general, they had begun the year with a larger unexecuted order sheet than that with which they began the year under review.

The British Oxygen Co., Ltd.—Presiding at the annual meeting held on May 26th Dr. J. D. Pollock (chairman) said that the expansion of the welding business continued during the year in both the oxy-acetylene and electric systems. Electric welding was developing rapidly, and its applications were largely in a field not competitive with oxy-acetylene welding, in addition to which electric welding, in many of its applications, necessitated cutting and bevelling of plates and other sections, and for such cutting and bevelling oxygen was used to a large extent. The two systems tended to be more closely allied and the directors had decided that, rather than still further extend the electric welding department of the company, it would be better to ally themselves with an old-established company engaged in electric welding development. The purchase of the share capital of the Quasi-Arc Co., Ltd., and the Ferro-Arc Welding Co. allowed them to group the technical resources of oxy-acetylene and electric welding and to place their organisation in a position to give unbiased information on welding and welding problems.

Broadcasting Relay Service, Ltd., held its annual meeting on May 31st, when Sir H. Brent Brotrian, Bt. (chairman), who presided, said that during the past year they had continued to add to the networks of existing businesses in the towns where they were operating. In many of these towns there was a tendency for the population to spread outwards, and it was, therefore, essential for them to continue to extend their outlying networks as building development proceeded. The Post Office had lost no time in setting up a department to investigate and report on their technical research, also practical and experimental work on the distribution of broadcast programmes by wire, in order that a decision could be made concerning the future development of wired broadcasting. He still hoped that the Government would come to the conclusion that a relay exchange was not a suitable operation for the Government to undertake.

Parkinson & Cowan, Ltd.—Presiding at the annual meeting on May 28th Lt.-Col. H. W. Woodall (chairman and managing director) said that during the year useful additions to their works had been completed, but they were still hampered by their inability to secure delivery of plant and apparatus ordered many months ago. Dealing with their subsidiaries, they were concerned, through Measurement, Ltd., with electricity and water meter business, for both of which a high reputation had been established. In Australasia they had a large holding in a company which manufactured electricity meters, refrigerators, wireless sets and petrol pumps. With regard to the outlook, industry to-day was carried on under war-time conditions, and in common with other manufacturers they were experiencing great difficulty in securing deliveries of raw materials. Up to the present, however, their output had been well maintained.

The West of England Electric Investments, Ltd., reports a net income for the year ended March 31st of £35,206, as compared with £24,579 in the preceding year, to which is added £456 brought in. A dividend of 5 per cent. has been paid and £5,662 is carried forward. The report states that in pursuance of the policy of reducing the number of separate undertakings wherever possible the Minehead company has offered to acquire the undertaking and assets of the Porlock company. The extension of the companies controlled by the Investment Company continues in all parts of the area. The sales of electricity in 1936 amounted to 18,520,000 kWh, as compared with 15,550,000 kWh in the previous year, an increase of 19 per cent., and the number of consumers rose from 29,550 to 33,200.

South Wales Electric Power Co.—The subscription list opened on Tuesday last for an offer for sale of £1,000,000 3½ per cent. debenture stock at £98½ per cent. The company has outstanding £112,500 of 5 per cent. prior lien debenture stock and a temporary loan obtained to enable £876,200 of the same stock in the hands of the controlling company to be redeemed. Both are to be cleared off out of the proceeds from the present offer for sale. The new stock is to be repaid within thirty years by means of the accumulative sinking fund, but the company will have the option of redeeming the whole or any part of the stock on or after June 1st, 1947.

The Revo Electric Co., which was made a public company in January, 1936, has announced a distribution for the year to March 31st of 17½ per cent., which compares with the equivalent of 15.1 per cent. for the previous year, when an interim dividend of 5 per cent. was paid on smaller capital and 12½ per cent. on enlarged capital when the company was converted.

Newton Brothers (Derby), Ltd., held their annual meeting on May 20th at Derby, when Mr. P. C. Cooper-Parry (chairman), who presided, said that the report and accounts justified the opinion expressed at the last meeting that the turn in the company's fortunes had been reached. The net profit for the year under review was £10,097, out of which £5,000 was placed to reserve. The dividend for the year was 7½ per cent., £2,135 was to be carried forward. They had an investment of £7,500 in the Haslam Foundry & Engineering Co., Ltd., and this company earned a trading profit for the past year, though not quite sufficient to cover full depreciation. The prospects for the coming year were bright. The orders on hand at March 31st, 1937, were almost double those in March of last year and the incoming orders since had continued satisfactory. They were faced with increased manufacturing costs in every direction coupled with difficulties in obtaining supplies, but the indications of the first quarter of the current year gave promise that the trading result for the full year should be satisfactory.

Ward & Goldstone, Ltd., propose to pay a final dividend on the ordinary shares at the rate of 10 per cent. per annum, less tax, making 15 per cent. for the year. It is also proposed that the sum of £7,776 shall be capitalised and issued as fully paid ordinary shares of 5s. each, ranking *pari passu* in all respects with the existing issued ordinary shares, to ordinary shareholders in the proportion of one new share for every ten ordinary shares held.

The Chloride Electrical Storage Co. reports a profit for the year ended March 31st of £432,400, as compared with £426,825 for 1935-36. It is proposed to pay a final dividend of 5 per cent., and a bonus of 5 per cent on the "A" and "B" ordinary shares, making a total distribution of 15 per cent. for the year (same).

Ruston & Hornsby, Ltd., report a net profit for the year ended March 31st of £140,905, as compared with £109,829 in the preceding year. The ordinary dividend for the year is 6½ per cent. (against 5 per cent.), general reserve £50,000, and £50,124 is to be carried forward.

Webb's Crystal Glass Co. reports a profit for 1936 of £12,022, as compared with £12,400 in 1935. It is proposed to pay a dividend of 6 per cent. on the participating ordinary shares (against 5 per cent.), and to carry forward £13,806.

Crompton Parkinson, Ltd., have declared an interim dividend of 6 per cent., actual, on the ordinary and "A" ordinary shares. This is at the same rate as last year, but is on larger capital.

S. Smith & Sons (Motor Accessories), Ltd., have announced an interim dividend of 7 per cent., on the preferred ordinary shares (against 5 per cent.).

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets have been kept in a state of uncertainty by a variety of events, some domestic, some foreign. Of the former, the National Defence Contribution Tax, now withdrawn, has proved the principal deterrent to business. Of the latter, the developments in Spain continue to exercise restraint upon willingness either to invest money or to speculate with it.

The outstanding feature in the markets with which we more particularly deal is the weakness of Home Electricity Supply shares, brought about by the proposed Bill to give effect to the McGowan Report. The proposals are a good deal more drastic than had been anticipated. Their effect has been to create a feeling of uneasiness in the minds of investors who, having bought electricity supply shares, regarded these as gilt-edged securities, almost immune from the risk of depreciating to any noticeable extent.

Electricity Supply Shares

The general relapse in the market for electricity supply shares reflected last week's rather sudden change of attitude towards the Government's intentions for reorganising the industry. A measure of nervousness has doubtless been existing, in the background, since the publication of the McGowan Report; but it was not until two or three days had elapsed for digestion of the Government's memorandum to the representative bodies that apprehension became effective. The market would be quite well disposed towards action which kept closely to the lines of the McGowan recommendations: it is at the points where Government ideas diverge from those lines that anxiety has been signalled. Particularly disliked is the threat of bureaucratic tendencies. Shareholders of the companies concerned are distrustful, also, of the proposed machinery for determining means and terms for bringing about the amalgamations. At the same time it is not forgotten that plans are still in a nebulous state, and that they will almost certainly be substantially modified before finding their way into the Statute Book.

Price Falls

The drop in prices of electricity supply shares originated with the appearance of one or two fairly substantial sellers of selected shares, as a result of which, and as a precautionary measure, quotations were marked down practically throughout the list. With little support forthcoming at the lower levels, and under a trickle of offerings by uneasy shareholders, the market presents an appearance in striking contrast with the firmness it displayed throughout the recent general collapse of prices in other Stock Exchange departments. Conditions have not been helped by the fact that people who bought shares a year or two ago may feel the moment propitious for turning capital appreciation into cash. Prices are some way below last year's high points, but tempting profits remain in

many instances. Few shares altogether escaped depreciation during the past week. Attention may be drawn to the fact that yields, on the basis of the last-paid dividends, now average about 4¼ p.c. on the money.

Manufacturing and Equipment

Business in industrial markets is practically strangled, except in a few instances, by the unknown quantity of the new tax. The feeling that current share prices discount a good deal of its incidence has checked any disposition towards further selling of a heavy character; but the fact remains that equities are, as a class, out of favour, and that the markets wear in consequence a dispirited air. Although the considerations which are depressing the neighbouring electricity supply market should not, on the face of things, disturb manufacturing and equipment descriptions, some sympathetic weakness may, nevertheless, have been induced. While, however, price movements during the week have generally been downwards, these have been neither numerous nor serious. Among the leading shares, General Electrics fell 3s., to 83s.; Johnson & Phillips, British Insulated, Henleys and Crompton Parkinsons moved to lower levels. The repetition of last year's interim dividend on the present larger capital of Crompton Parkinson was generally expected. Exceptionally, Enfields advanced to 5⅝. Aron Meters remain firm at 2¾: the final dividend of 10 per cent., making 15 per cent. for the year. is the same as before.

Fixed-interest Investments

While unpalatable to holders of industrial ordinary shares, the defunct N.D.C. gave a new stimulus to the previously flagging interest in fixed-dividend stocks. The supply of industrial preference and debenture issues diminishes daily, with the result that the better class investments of this description are now hard to come by. For the buyer wanting anything like large quantities, the list is, indeed, very limited. At the time of writing, however, such a buyer could probably fulfil his requirements, in the electrical equipment group, with British Thomson-Houston 7 per cent. preference at 33s., or, in the electricity supply section, with Clyde Valley 8 per cent. preference at 40s. 6d., or Midland Electric Power 7 per cents. at 35s. Each of the last two yields about 4 per cent.: the first-mentioned returns 4¼ per cent. on the money. Among debentures on offer may be mentioned the 3¼ per cent. issues of Edmundsons and London Power, both of which can be bought to yield £3 7s. 6d. to the buyer.

Transport Stocks

Market reaction to the settlement of the bus strike was more pronounced in the London Transport Board's fixed-interest issues than in the price of the "C" stock. Since holders of the latter were footing the bill for the stoppage they may feel some disappointment that the response was limited to a one-point rise—which proved to be no more than temporary. That this was so may be ascribed to the check to optimism resulting from the financial facts which came to light during the course of negotiations. The prospects of "C" stockholders receiving standard payments, now at the rate of 5½ per cent., have certainly become blurred, not only by the bus stoppage, but by the manner in which higher costs have eaten into this year's better receipts. The prices of the "A" and "B" stocks have risen to 116¼ and 117¼ respectively. British Electric Traction deferred, at 1400, is 75 points down; the price, ex dividend, still cum the scrip bonus. Tillings, at 64s., are flat. Brazilian Tractions reached 26, to revert to 24½.

Whitehall Electric

Publication of the Whitehall Electric Investment accounts was well received, largely because better results have been achieved, despite the absence of any return during the year from the company's large Spanish interests. The improvement was due, it appears, partly to an advance in the company's West of England investment, and partly to similar progress in the Athens subsidiary, which experienced an amelioration of long-standing exchange difficulties. The company's American and Investment Power holding is at present unproductive, but affairs in this direction may well be on the up-grade under the influence of transatlantic conditions. A yield of 6¾ per cent. on the preference shares is witness to the uncertainties of prospects, but this week's rise in price indicates some confidence in a widening of the safety margin. The ordinary shares, mostly in private hands, have had no dividend for four years.

Miscellaneous Matters

Cable & Wireless preference continues to be bought and the yield is now a trifle under 5 per cent. on the money. Globe ordinary shares have lost 5s., but the preference at 14¼ are the fraction to the good. Anglo-American Telegraph preferred has gone further ahead and is now up to 126½. American "Tel. and Tel." at 168¼ parted from half its rise of the previous week. Iron and steel shares have fallen under the malinfluence of N.D.C. Rumour was current in the Stock Exchange this (Tuesday) afternoon to the effect that the Government were prepared to abandon the tax and to substitute for it a less unpopular form of obtaining money. The subsequent announcement in the House of Commons proved that, for once in a way, Rumour was right. The relief to Stock Exchange markets cannot fail to be striking and widely spread in its effects.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Last.	Price. June 1.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	1	15	15	71/3	−⅛	4 4 3
City of London	1	7½	7½	34/6	−6d.	4 7 0
Clyde Valley	1	7	8	41/–	—	3 18 1
County of London	1	10½	10½	48/–	−1/6	4 7 6
Edmundson's 7% Pref.	1	7	7	35/–	−1/–	4 0 0
Do. Ord.	1	8	9	42/–	—	4 10 0
Elec. Dis. Yorkshire	1	9	9	43/–	—	4 3 10
Elec. Fin. and Securities	1	12½	12½	2⅞	—	4 7 0
Elec. Supply Corporation	1	11	12	54/6	−2/6	4 8 1
Lancs Light and Power	1	7½	7½	33/–	−1/–	4 11 0
Lond. Assoc. Electric	1	—	7	33/3	—	4 4 2
London Electric	1	7	8	36/–	—	4 9 0
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	45/6	−2/6	4 9 0
Midland Counties	1	7½	8	37/6	−2/–	4 5 4
Mid. Elec. Power	1	8	9	2	—	4 10 0
North Eastern Electric Ordinary	1	6	7	32/–	−1/6	4 7 6
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	47/6	−⅛	4 4 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	47/6	−2/6	4 4 2
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
Scottish Power	1	8	8	37/–	−2/–	4 6 6
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	+1/–	6 10 0
Yorkshire Elec.	1	8	8	41/–	−1/6	3 18 1
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	114	—	4 7 9
Do. 1955–75	„	5	5	115½	—	4 6 7
Do. 1951–73	„	4½	4½	111	+½	4 1 1
Do. 1963–93	„	—	3½	98½	—	3 11 1
London Elec. Trans. Gtd.	„	—	2½	91	—	2 15 0
London & Home Counties, 1955–75	„	4½	4½	110	—	4 1 10
London Passenger Transport, A	„	—	4½	116½	+1	3 17 3
Do. do. B	„	—	5	117½	+2	4 5 1
Do. do. C	„	4	4	86	—	4 13 0
West Midlands Joint Elec. 1948–68	„	—	5	112½	—	4 9 0
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	168½	−2	5 6 10
Anglo-Am. Tel. Pref.	Stock	6	6	126½	+1½	4 15 0
Do. Def.	„	1½	1½	29	—	5 3 5
Cable & Wireless 5½% Pref.	„	4½	5½	112	+½	4 18 2
Do. A. 7½% Ord.	„	Nil	Nil	25	—	—
Do. B. Ord.	„	Nil	Nil	6½	−½	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	15½	−½	2 17 1
Do. do. Pref.	10	6	6	14½	+½	4 5 0
Great Northern Tel.	10	20	20	41½xd.	—	4 16 5
Marconi-Marine	1	10	7½	1⅛	—	4 5 9
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	21½	—	—
British Electric Traction Df. Ord.	„	5	5	1400	−75	—
Do. do. Pref. Ord.	„	8	8	165xd.	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	24½	+½	—
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	−1½	—
Do. 1st Bonds	$500	5	5	44½	+1½	—
Victoria Falls Ord.	1	20	12	65/–	−⅛	3 13 10
West Riding	1	6½	10	40/3	—	4 6 6
MANUFACTURING COMPANIES						
Aron Electricity Ord.	1	10	15	2¾	—	5 9 1
Assoc. Elec. Ord.	1	8	10	47/6	−2/–	4 4 2
Do. Pref.	1	8	8	38/–	—	4 4 3
Babcock & Wilcox	1	8	10	50/–	—	4 0 0
British Aluminium Ord.	1	7½	10	50/–	−1/–	4 0 0
British Insulated Ord.	Stock	20	20	4⅝	−⅛	4 7 9
Brush Ord.	Stock	Nil	Nil	61½	—	—
Callender's	1	15	15	4½	—	3 4 0
Do. 6½% Pref.	1	6½	6½	30/–	—	4 6 8
Crompton Parkinson Ord.	5/–	12½	12½	63/–	−⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	3½	7	37/6	—	3 14 8
Enfield Cable Ord.	1	25	25	5⅝	+⅛	4 10 0
English Electric	1	Nil	Nil	33/0	−6d.	—
Do. do. Pref.	1	6½	6½	26/–	—	5 8 4
Ericsson Tel.	5/–	20	25	50/–	−⅛	2 10 0
Ever Ready	5/–	35	45	32/–	+6d.	7 0 10
Ferranti Pref.	1	7	7	27/6	—	5 2 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	10	15	83/–	−3/–	3 12 3
Henleys	5/–	30	15	19/6	−6d.	3 17 0
Do. 4½% Pref.	1	4½	4½	1⅛	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	41/3	−½	4 17 0
Lancashire Dynamo	1	10	20	3⅛	—	6 1 0
Siemens Ord.	1	6	7½	31/3	−⅛	4 16 0
Telegraph Construction	£1	Nil	7½	2⅛	—	3 8 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

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24080. "Mercury-arc rectifiers." British Thomson-Houston Co., Ltd., and F. P. Whitaker. August 28th, 1935. (465201.)
24291. "Bases for electric switches." R. Schneider, K. Milferstedt and A. Walter. September 1st, 1934. (465202.)
27109. "Wattmeters." W. W. Triggs (Doble Engineering Co.). October 1st, 1935. (465205.)
27178. "Carrier-wave signalling systems." Ferranti, Ltd., and M. K. Taylor. October 2nd, 1935. (465405.)
27286. "Cathode-ray tubes." Ferranti, Ltd., and J. C. Wilson. October 3rd, 1935. (465266.)
29881. "Wireless and like signalling apparatus." J. Robinson. October 29th, 1935. (Addition to 435621.) (465461.)
29951. "Electric bus-bars or like main conductors." A Reyrolle and Co., Ltd., and F. J. Bown. October 30th, 1935. (465342.)
30064. "Scanning and synchronising system for television systems." P. T. Farnsworth. October 31st, 1935. (465344.)
30253. "Control of variable attenuation of networks for alternating signalling or like systems." Telephone Manufacturing Co., Ltd., B. J. Burridge and L. H. Paddle. November 1st, 1935. (Addition 442947.) (465464.)
30312. "Means for mechanically operating electric switches from a distance." H. C. Ward and S. G. Pickering. November 2nd, 1935. (465466.)
30434. "Electric condensers." General Electric Co., Ltd., and R. W. Speirs. November 4th, 1935. (465273.)
30475. "Electric measuring instruments." J. Cruwys, J. P. Keith, and Power Equipment Co., Ltd. November 4th, 1935. (465206.)
30479. "Valve amplifying circuits for television and like purposes." Baird Television, Ltd., and D. M. Johnstone. November 4th, 1935. (465276.)
30585. "Manufacture of electric cables." British Insulated Cables, Ltd., A. Sargent, Micanite and Insulators, Ltd., and A. Collins. November 5th, 1935. (465472.)
30587. "Relay switching arrangements for telephone or like transmission systems." Standard Telephones and Cables, Ltd., and K. E. Latimer. November 5th, 1935. (Addition to 14406/35.) (465353.)
30608. "Electric remote indicating systems." P. F. Gunning. November 5th, 1935. (465356.)
30713. "Vacuum-tight seals for the leading-in conductors of electric-discharge lamps." British Thomson-Houston Co., Ltd., and W. J. Scott. November 6th, 1935. (465475.)
30726. "Electrical conductors." Westinghouse Electric and Manufacturing Co. November 8th, 1934. (465476.)
30785. "Systems of control for electrically operated lifts." General Electric Co., Ltd., and N. C. Smart. November 7th, 1935. (465480.)
30817. "Gaseous or vapour electric-discharge lamps." British Thomson-Houston Co., Ltd., and H. R. Ruff. November 7th, 1935. (465481.)
30834. "Very-high-frequency electrical oscillation generators." Marconi's Wireless Telegraph Co., Ltd. November 28th, 1934. (465482.)
30835. "Electronic amplifier valves." Marconi's Wireless Telegraph Co., Ltd., N. M. Rust and G. F. Brett. November 7th, 1935. (Addition to 403973.) (465483.)
31139. "Systems of step-by-step type-printing telegraphy." Exchange Telegraph Co., Ltd., and T. A. Kirton. November 11th, 1935. (465491.)
31161. "Prepayment-type electric supply meters." English Electric Co., Ltd., and G. Tilstone. November 11th, 1935. (465492.)
31314/31316. "X-ray tubes." T. E. Allibone, F. E. Bancroft and Metropolitan-Vickers Electrical Co., Ltd. November 12th, 1935. (465495/465496.)
32039. "Radio receiving circuits." Plessey Co., Ltd., C. E. G. Bailey and G. Baillie. November 19th, 1935. (465282.)
32824. "Self-locking devices for electric incandescent lampholders." G. H. Fletcher and W. A. Cooke. November 27th, 1935. (465214.)
33919. "Electric switching devices." Siemens Bros. and Co., Ltd., E. J. Gachet and H. E. Humphries. December 6th, 1935. (465216.)
34206. "High-voltage condenser." Radioakt.-Ges. D. S. Loewe. December 11th, 1934. (465289.)

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3229. "Electrolytic devices such as capacitors." British Thomson-Houston Co., Ltd. February 2nd, 1935. (465299.)
3429. "Electromagnetic relays." General Electric Co., Ltd., and W. R. Rose. February 5th, 1936. (465300.)
3964. "Interlocking electric switch plugs." W. Sanders and Co. (Wednesbury), Ltd., and W. Preston. February 10th, 1936. (465375.)
5089. "Electric circuit-breakers." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. February 19th, 1936. (465380.)
7659. "Electric resistances." H. Seabrook (Ges. zur Verwertung Chemisch-Technischer Verfahren Akt.-Ges.). August 19th, 1936. (465308.)
7827. "Small transformers, more particularly for electric lamp fittings." J. Stoffels, H. Wyland and Dr. R. Speyer. October 22nd, 1935. (465309.)
9392. "Method of manufacturing electrical insulating materials." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 2nd, 1935. (465311.)
11275. "Spark plugs." Breeze Corporations, Inc. June 12th, 1935. (465425.)
14099. "Radio and like transmitters." Telefunken Ges. für Drahtlose Telegraphie. May 18th, 1935. (465432.)
14105. "Casettes for Röntgen-ray photography." Degea Akt.-Ges. Auerges. June 25th, 1935. (465433.)
14323. "Motor control systems." British Thomson-Houston Co., Ltd. May 22nd, 1935. (465435.)
15539. "Electrically operated indicators." W. Grothe and Agro Electrical Co., Ltd. June 3rd, 1936. (465230.)
15774. "Electric cables." Okonite Co. June 25th, 1935. (465321.)
15776. "Electric cables and the manufacture thereof." Okonite Co. June 13th, 1935. (465322.)
16445. "Sound reproducing apparatus." Philco Radio and Television Corporation. June 17th, 1935. (465441.)
18053. "Station indicating devices for radio apparatus." Minerva-Radio W. Wohleber and Co. June 27th, 1935. (Cognate application, 18054/36.) (465442.)
19546. "Electrical plug-and-stocket connectors." Cinch Manufacturing Corporation. August 3rd, 1935 (465324.)
20086. "Impregnation of windings of electrical machines." E. W. Frenkel (trading as H. Frenkel, a firm). July 19th, 1935. (465237.)
20527. "Telegraph signalling systems." Standard Telephones and Cables, Ltd. August 30th, 1935. (465238.)
22837. "Arc lamps." Opticolor Akt-Ges. August 19th, 1935. (Addition to 456204.) (465452.)
26040.) "Electrical speed-indicators for extrusion presses for metal tubes and rods." Schloemann Akt-Ges. November 19th, 1935. (465250.)
26245. "Indirectly-heated cathode for cathode-ray tubes." Vereinigte Glühlampen und Elektrizitats Akt-Ges. October 1st, 1935. (465332.)
28888. "Radio receiving systems." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 26th, 1935. (465333.)
28909. "Radio transmitters and the like." Marconi's Wireless Telegraph Co., Ltd., October 31st, 1935. (465456.)
29554. "Electron-discharge devices." Standard Telephones and Cables, Ltd. January 9th, 1936. (465334.)
32575. "Electrical conductors." Westinghouse Electric and Manufacturing Co. November 8th, 1934. (Divided out of 465476.) (465502.)

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4681. "Gas-filled electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 19th, 1936. (465337.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned :—

May 19th.

Tu-Fon. No. 574503. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes or in relation to the health of men or animals.—Lingner Vertriebs Gesellschaft, Dresden, Germany (British representatives, Trade Mark Owners Association, Ltd., 31-34, Basinghall Street, E.C.2).

May 26th.

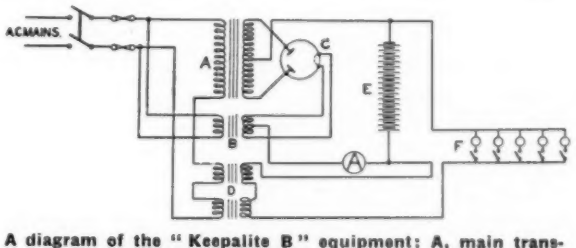
Lighthouse (design only). No. 575255. Class 13. Electrodes of ordinary metal for use in arc welding.—Rockweld, Ltd., Commerce Way, Purley Way, Waddon, Croydon.

Monarch-Electric. No. 572153. Class 14. Kettles, saucepans, coffee percolators, and shaving pots, all being electrically heated and all being goods of aluminium or in which aluminium predominates.—Eveson Bros. (1928), Ltd., Stanley Works, Wollescote, Lye, Worcestershire.

Floating Battery Equipment

For safety lighting in cinemas, no matter how carefully the rectifier output is adjusted to keep the battery floating, any change in the circuit conditions quickly disturbs the equilibrium, and the battery may either be charged too much, with a consequent rise in voltage on the secondary lighting, or may discharge too much, thereby reducing the capacity of the battery available for emergencies. This has led in many cases to the stipulation that the whole of the secondary lighting load of a cinema shall be switched on at one time, even though some parts of the cinema, such as staircases, corridors, crush halls, &c., do not require such emergency lighting until dusk.

New equipment is now available in which this difficulty has been overcome. It is known as the "Keepalite B" equipment (the invention of Mr. Basil Davis) and is marketed by the Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester.



A diagram of the "Keepalite B" equipment: A, main transformer; B, filament transformer; C, full wave valve; D, control chokes; E, storage battery; and F, cinema safety lights

The principal feature is a set of governing chokes specially wound and so connected between the circuits that wide changes in loading can be made without affecting the accurate floating of the battery. With the new equipment it is only necessary for a cinema attendant to switch on the a.c. supply to the rectifier and then switch on the secondary lighting. The control automatically gives the proper floating position without further manipulation or adjustment.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Extension to Victoria Hospital; J. R. Ashworth, architect, Palace Buildings, Peel Street.

Alnwick.—Houses (40); R.D.C. surveyor.

Baginton (WARWICKSHIRE).—Extensions to aircraft factory; W. G. Armstrong-Whitworth Aircraft, Ltd.

Barking.—Houses and flats, London Road; borough engineer. Factory, Alfred's Way; Invicta Foil Co., Ltd., 101, Leadenhall Street, London, E.C.3.

Barnet.—Factory, Elstree Way; Kautex (Plastics), Ltd. Two factories, Elstree Way; J. Laing & Son, Ltd.

Basingstoke.—Cinema, Wote Street, for W. Hayward.

Bebington.—Houses (1,330), Brimstage Road and Mount Road, for Lever Bros., Ltd., Port Sunlight.

Berkshire.—School, Windsor, for County E.C.; W. F. Herbert, education secretary, Shire Hall, Reading.

Bilston.—Houses (46), Moseley Road, St. Chads estate (£14,973); housing architect.

Birmingham.—Factory, Plume Street, Aston, for Verity's, Ltd., Nechells; Bowen Bros., builders, George Street, Birmingham. Laundry, Charlotte Road, Stirchley, for the Ten Acres and Stirchley Co-operative Society, Ltd., Stirchley, King's Norton. Rebuilding hotel premises, Bolton Road, for Mitchells & Butlers, Cape Hill; P. W. Cox, Ltd., builders, Handsworth. Reconstruction of works, Summer Lane, for Newey Bros., Ltd.; Harper & Sons, builders, Lombard Street.

Blaydon-on-Tyne.—Houses, Stella Lane, for the Cowen Estates, Ltd.; J. R. Wallace, architect, 20, Northumberland Square, North Shields.

Bolton.—Technical college, Manchester Road (£241,100), for E.C.; Tarran Industries, Ltd., Hull.

Bournemouth.—Sanatorium hospital, Linford, near Ringwood (£50,000); borough surveyor.

Bramley (YORKSHIRE).—Cinema, Town Street; H. Womersley, 1, Rock Lane.

Brierley Hill.—Houses (71), Thorns Farm estate (£27,743); A. Webb & Sons, builders, Quarry Bank.

Brighton.—Development of Withdean estate west; Harold Williams & Partners, Croydon, Surrey.

Bristol.—Maternity ward blocks and nurses' home at the Southmead Hospital; city architect, Council House. Premises, St. Philips, Barton Road, for H. J. Heinz Co., Ltd., Harlesden, London, N.W.10.

Carnforth.—Houses (22), Crag Bank; F. Haycock.

Chelmsford.—Houses (20), Second Avenue; H. J. Jackson & Co.

Chertsey.—Houses (32); U.D.C. surveyor.

Chesterfield.—Houses, Hazelhurst Lane and Thornfield estate; Jack Jones, builder, High Hazels, Sheffield.

Cirencester.—Houses (26), Siddington Road; U.D.C. surveyor.

Colchester.—Second section of Harwich Road Council school (£13,195), for E.C.; F. Hutton & Son, builders, Birch.

Coseley.—Houses (24), Dimmock Avenue; Mrs. A. Hipkins, The Paddock.

Coventry.—Houses (1,000), Canley (£444,682); city engineer.

Croydon.—Shops and offices, Crown Hill; Saxone Shoe Co., Ltd. Showrooms, High Street; South London Motors, Ltd., 516, High Road, Streatham, S.W.16. Enlargement of Manor school, Norbury, for Croydon E.C.

Dagenham.—Houses, Crowlands, Stanley, Laneside, and Rosslyn Avenues; A. E. Johnson, builder, Carlton House, Upminster Road, Hornchurch.

Darlington.—Houses, Elton Road, &c.; H. Parvin & Sons, builders, 17, Horsemarket, Darlington. Houses (68), Geneva Road West; borough engineer. Alterations, Havelock Street, for the Darlington Equitable Building Society; Dunn & Dunwell, builders, Arden Street.

Doncaster.—Works, Wheatley, for the Eburite Corrugated Containers, Ltd., Park Royal Road North, N.W.10; T. H. Johnson & Sons, architects, 20, Priory Place, Doncaster.

Dudley.—Houses (116), Saltwells estate (£43,965); Eadie & Co., buiders, 29, Waterloo Road, Wolverhampton. Police buildings, fronting on Tower Street and New Street; F. H. Gibbons, borough surveyor, Council House.

Durham.—Schools, Pittington, Springwell and Pelton-Newfield; F. Willey, county architect, 34, Old Elvet, Durham.

Edgware.—Houses (405), Marsh Lane, Stanmore; D.C. Houses, Ltd., builders, Great Marlborough Street, London, W.1.

Elland.—Houses (40), Heathfield estate; U.D.C. surveyor.

Enfield.—Houses (78), Addison estate; Swannell & Sly, 2, High Street, Pinner. Houses (38), Arbour Road; Farebrother Ellis & Co., 29, Fleet Street, London, E.C.4. Houses (123), Phipps Hatch Lane; Hamilton, Son & Campion. Flats (120), near Green Street; Bunting Construction Co., Ltd., 49, Baker Street, London, W.1.

Glasgow.—Improvements to schools (£20,000); education director.

Goole.—Houses (40), Swinefleet and Rawclift; A. Wortley, builders, Doncaster.

Greenford.—Houses (120), Western Avenue; R. Lancaster & Sons, builders, Wembley. Factory and offices, Western Avenue, for Peerless Kitchen Cabinets, Ltd., 13, Alperton Lane.

Hanley.—Houses (60), Abbey Road; Tideswell Bros.

Harrogate.—Modernisation and enlargement of the Royal Baths (£66,000); borough surveyor.

High Wycombe.—Factory and power house, near Cressex Lane, for A. J. Way & Co. Shops and offices, High Street; Bucks Free Press, Ltd.

Irlam.—Houses (100), Ferry Hill Road; T. W. Holmes, architect, 87, Lord Street, Liverpool, 2.

Jarrow-on-Tyne.—School, Borough Road; borough engineer.

Lancashire.—School, Knowsley (£47,500), for County E.C.

Leamington.—Bus depôt, Warwick Old Road; Birmingham & Midland Bus Co., Ltd.

Leatherhead.—Houses (60), Cleeve Road; U.D.C. surveyor.

Leicester.—Cinema (£35,000), Rutland Square, for the Odeon Theatres, Ltd.; W. Moss & Sons, Ltd., builders, Loughborough.

Lichfield.—Houses (58), Boney Hay, Chase Terrace; J. G. Rimand, surveyor, Council House.

London.—(POPLAR).—Factory, 35-7, Bow Road; J. Rabin & Co., 426, Mile End Road, E.1.

Lowestoft.—School, Notley Road (£24,700); R. G. Carter, Ltd.

Maidstone.—Houses, Hubbard's Lane, Loose, and Marden; R.D.C. surveyor.

Manchester.—Flats, Temple estate, Cheetham, and High School for girls' Whalley Range (£53,618); city architect.

Middlesbrough.—Offices, Borough Road, for the Constantine Shipping Co., Ltd., additions to nurses' home, North Ormesby Hospital, and alterations and additions to the Marlborough Cinema; Kitching & Co., architects, 21, Albert Road.

Neath.—Houses (57), Llanwit estate; borough engineer, Gwyn Hall, Neath.

Newport (SHROPSHIRE).—Cinema, High Street; Wright's Picture House (Newport), Ltd.

North Shields.—Houses, Seacrest Avenue; J. R. Wallace, architect, 20, Northumberland Square.

Oldbury.—Houses (18), Barnford Crescent; R. Perkins. Houses (61), Causeway Green estate; T. Mucklow.

Ormskirk.—Houses (62), Tattock's Farm, for G. A. Grundy & Co., 25, Hardshaw Street, St. Helens.

Oswestry.—Junior school (£12,583); David Davies & Sons.

Padiham.—Houses (56), Garden Street site; U.D.C. surveyor.

Reddish.—Cinema and shops; D. Macdonald, Ld., builders, Manchester.

Rochester.—Cement factory, Halling, for the Rugby Cement Co., Ltd.

Rowley Regis.—Houses (312), Throne Road estate; Clifford Buckley, town clerk, Council House, Old Hill, Staffordshire.

Rugby.—Houses (152), Hillmorton (£49,989); Youell, Ltd., builders, Coventry.

Salford.—Reconstruction of Royal Art Gallery, Peel Park (£16,980); Jones & Rawlinson, Ltd.

Scarborough.—Houses (98), Barrowcliff estate; Mollekin Brothers, builders, Maltby.

Seisdon.—Houses (42), Pattingham, Wombourne and Trysull; F. Bagley, engineer, Council Offices, Wombourne.

Sheffield.—Houses (26), Norton Lees Crescent; Skinner & Sons, Ltd. Houses (22), Sheffield Road; Fowler, Sandford & Potter. Cinema and shops, Attercliffe Road; H. J. Shepherd.

Shropshire.—Schools, Ellesmere, Much Wenlock, and Whitchurch, for County E.C., Shirehall, Shrewsbury.

Slough.—Factories, Edinburgh Avenue, Buckingham Avenue, and 4a, Bedford Avenue; Slough Estates, Ltd.

Spenborough.—Houses (998), Bleak Street and Craven Lane, Gomersal; S. Smith, builder, School Lane, Dewsbury Moor.

Spilsby.—Houses (34); R.D.C. surveyor.

Stockton-on-Tees.—Houses, Clifton Avenue, &c.; J. C. Watson, builder, Prudential Buildings. Houses, Hermitage Drive; Moorhouse & Barker, builders, Thornaby-on-Tees. Hotel, Durham Road, for C. Vaux & Sons, Sunderland; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Sunderland.—Offices and stores, Queen Street, for E.C.; electrical engineer, Dunning Street. School, near Alexandra Road, for E.C.; education architect, John Street.

Tipton.—Houses (74), Tibbington estate (£28,900); Wm. Whittingham, Ltd. Houses and shops, Willingsworth Road; H. Jenkins. Factory, near Bloomfield Road; Tipton Tub & Tube Co., Ltd.

Torquay.—Library, on site adjacent to the Town Hall (£33,000) with electrical work; R. E. Narracott, builders. Grammar school for Girls; H. V. de Courcy Hague, architect, 97, Heavitree Road, Exeter.

Tottenham.—Houses (24), Weir Hall estate, Section 5; borough engineer, Town Hall, Tottenham, N.15.

Tynemouth.—Houses (135), for the Sir James Knott Memorial Trust, Percy Square; A. K. Tasker & Child, architects, Trinity Buildings, Newcastle-on-Tyne.

Walsall.—Houses (83), Goscote site (Section 2); borough surveyor.

Wednesbury.—Infant Welfare clinic, Alma Street; A. Booth, borough engineer, Town Hall.

West Drayton.—Factory, Trout Lane, for the English Metal Powder Co.

Weston-super-Mare.—Aerodrome development (£38,484); U.D.C. surveyor.

Weymouth.—Extensions to bus depot, Terrace Street; Southern National Bus Co., Ltd.

Winchester.—Houses (46), Highcliffe Park; P. H. Warwick, city engineer, Guildhall.

Wombwell.—Houses (130), near Summer Lane; surveyor, Council House.

French International Electrical Congress

Under the auspices of the Syndicat Général des Installateurs Electriciens Francais and the Chambre Syndicale de l'Entreprise Electrique de Paris an international electrical congress is to be held in the French capital from June 16th to 19th. Among the subjects to be dealt with are the technical features of electric lighting installations, domestic and rural applications of electricity, telephony, radio-telephony reception, and technical education for electricians. Particulars of the congress can be obtained from the second of the two organisations mentioned above at 3, Rue Lutece, Paris.